THE IRON TRADE REVIEW

VOLUME XXIX. CLEVELAND, O. JANUARY 30, 1896. CHICAGO, ILL. NUMBER 5.

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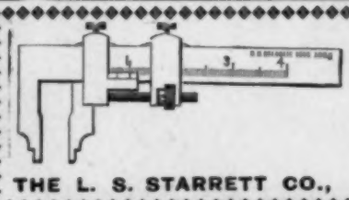

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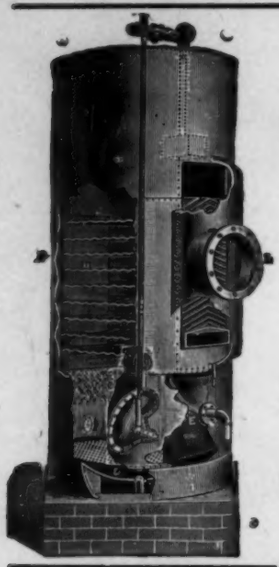

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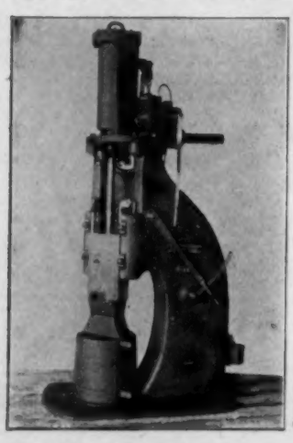

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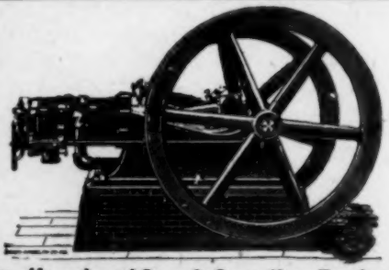

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THE IRON TRADE REVIEW

VOLUME XXIX. CLEVELAND, O. JANUARY 30, 1896. CHICAGO, ILL. NUMBER 5.

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

The first month of the new year has demonstrated that the iron trade, in common with other industries, is dominated by the financial conditions that have so engrossed attention in the past two months, and at the same time that iron and steel are in a position to respond quickly to any favorable influence. Thus far the improvement in price seems to be confined chiefly to Bessemer pig, steel billets, wire rods and gray forge. While a firmer stand has been taken here and there, by a producer of some form of finished material, the month has made a generally uniform record of weakness in mill products. Tonnage is the corrective, but it is still out of reach. It is to be expected that the temporary stringency in money will be relieved within another week, when the bond allotment is decided upon, and that enterprises involving requirements of iron and steel may be proceeded with, while hesitating buyers may be more disposed to take hold. Reports concerning Bessemer pig the past week indicate that the advance is firmly maintained and further sales at $12.50 in the valley and $13.25 Pittsburg, have been made since our last report, with $12.75 and $13 respectively in the valley mentioned in connection with two sales, the latter a special iron. Furnaces generally are holding for $13; with some $13.50 is the figure. Billets have participated in the Bessemer advance and $18 to $18.50 Pittsburg, are the quotations of mills with several sales at the former figure. While foundry irons have not changed in price and there are reports of cutting, particularly by certain Southern producers, there is a disposition on both sides of this market to confine deliveries to the next few months. There is little change in the conditions surrounding finished materials. The effect of the money situation is felt in building enterprises and structural contracts are waiting. The Western bar iron men are making a strong effort to increase the number of association mills, with some success. If plans now on foot are consummated the market will be more thoroughly under the control of the mills than at any time since the association was formed. A hopeful report, both in pig iron and steel and in several lines of mill products, comes from Chicago. Several sales of billets were made to Indiana mills, $19.50 Chicago being the basis in most cases. Structural work has also furnished a considerable tonnage in the Chicago district. The Eastern steel market is firm, the Philadelphia basis on billets being $20 to $20.25, with buyers closely following the mark. There is also a better aggregate of finished material orders in the East, and mills in that section are not pressing for business in the Central West as has been the case in the past few weeks. Some structural business has come up in Eastern cities. Plates are higher with most mills and at Pittsburg tank steel has advanced from 1.25c to 1.35c. Pittsburg has landed a large plate contract for water pipe. Eastern railroads have not been heard from yet, but the recent Inter-State Commerce Commission decision lowering steel rail rates to the Pacific coast has helped a home mill to get a rail contract there, said to amount to 20,000 tons.

THE CLEVELAND DISTRICT.

Some lots of Mesabi ores have been sold of late at an advance of $1 a ton over the opening price last year, or a basis of $3.75 for the best Bessemers on that range. Some re-sales of ores by furnaces are also reported. It is understood that the allotment of Bessemer ores for the coming year, which may now be spoken of as practically an accomplished fact, is quite favorable to Mesabi producers. The .045 phosphorus limit, which has been established for years in connection with certain old-range ores, is stretched to .07, letting in any Mesabi ores that might become part of a Bessemer mixture. The 3,500,000 tons of Mesabi ores below .07 in phosphorus that will be shipped in 1896, if the market calls for that much, includes the 600,000 or 700,000 tons of these ores sold for 1895 delivery, but not shipped because of high freights.

Pig Iron. Valley furnaces are somewhat firmer in their position on Bessemer and some of them are now unwilling to sell at $13 at furnace. It is noted that furnace companies having connections in the ore trade are higher in their ideas than some of their competitors—a fact that is suggestive of the present condition of the ore agreement for 1896. Sales at $12.50 in the valley have been made since our last report, and $12.75 and $13 are named in connection with two sales. The latter was of 1,000 tons, sold at $13.75 delivered in Cleveland, the chemical requirements being lower than for standard Bessemer. A $13.50 valley furnace sale has caused some comment. The metal is for Eastern shipment and while the deal was closed, it was not made with a consumer and up to this time means little more than an option. No preparations are making as yet to get any of the idle valley furnaces in blast, with the exception of one in the Mahoning valley. Its resumption will soon be offset, however, by the going out of another stack in the same valley. Foundry irons have not shared any of the activity of Bessemer. Lake Superior charcoal may have sympathized slightly, but prices are not improved. We hear of a sale of 1,000 tons at $14.25, Cleveland. Quotations range from this figure to $1 higher. Coke irons are selling in small lots at $12.00 to $12.25 in the valley for No. 2 and $12.75 to $13.25 for No. 1. On Scotch iron $12.25 for No. 2 and $13 for No. 1 are minimum with one well known producer. In the recent sales of pipe iron in the Cleveland market the order was divided among Southern and Northern furnaces. Some of the Southern iron taken is believed to have been in second hands for money advances, and the price was in the neighborhood of $10.90 Cleveland. The Northern gray forge taken on this contract was at considerably higher figures. Gray forge in the valley is firmer and furnaces are now holding for $11, or $11.75 Cleveland.

Finished Material. Reports agree that inquiries are multiplying in the Central Western district, but there is considerable difference between mills as to the condition of order books, and hence quotations vary. Eastern mills seem to be filling up, and some of them that were active competitors for business in the Cleveland district early in the month are not now heard of. An

Continued on page 7.

THE CHICAGO OUTLOOK.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

The tone of the market continues to improve, and both buyers and sellers are feeling very much more confident of the future, with the result that buyers are now trying to place their orders at the lowest ruling prices for as large a tonnage and as long deliveries as possible, while mills and furnaces are endeavoring to make all their sales for delivery within a short time, and are not so much inclined to cut quotations as they were a week or two ago. A number of large contracts for various classes of material are pending, and will probably be closed up within the next week or ten days. Buyers appear to be only holding off while trying to get makers of material to meet their views on deliveries. Nearly all the business that was closed last week was for delivery within two or three months, and mills and furnaces seem to prefer not to load up with large orders running into six months or longer deliveries at present prices. On one or two products the market has advanced materially in the last week.

PIG IRON.—A very large demand is noted for both Northern and Southern irons, and while very little of the former was sold last week, there is a probability of much larger in the present week. A number of buyers who are in the market for large amounts, and have been for some time, are reported to have made up their minds that now is a good time to buy. Prices of Northern irons are firmly maintained by all the furnaces. Southern iron was in large demand last week, and the total of sales was much larger than for any week for some time. A number of large contracts were given out, and the active market showed that prices are being held at about the figures given below. It is possible that these prices were lowered in a few instances, but the statement is made that no large tonnage for long deliveries could be placed with Southern firms much if any under these quotations. A good many users of Southern irons have yet to cover their needs and are expected to place their orders soon. Lake Superior charcoal has been quiet, with only a fair amount of business closed. Quotations are made as follows:

Lake Sup. Charcoal	$14 50@15 50	Southern No. 2 Soft	$11 85@12 35
Local Coke Fdy. No. 1	13 50@14 00	South'n Silveries No. 1	13 35
Local Coke Fdy. No. 2	13 00@13 50	South'n Silveries No. 2	12.85
Local Coke Fdy. No. 3	12 50@13 00	Jackson Co. Silveries	14 50@16 00
Local Scotch Fdy. No. 1	13 50@14 00	Ohio Silveries No. 1	15 00@15 50
Local Scotch Fdy. No. 2	13 00@13 50	Ohio Silveries No. 2	14 50@15 00
Local Scotch Fdy. No. 3	12 50@13 00	Ohio Strong Softeners	15 00@15 50
South'n Coke No. 1	12 35@12 85	Alabama Car Wheel	17 50@18 00
South'n Coke No. 2	12 10@12 35	Malleable Bessemer	.....
South'n Coke No. 3	11 85@12 10	Coke Bessemer	.....
Southern No. 1 Soft	12 35@12 85		

BARS.—Inquiries for several round lots of iron and steel are in the market, and a number of good sized orders were closed up last week. The general tone is of greater strength, and not so many rumors of cuts in prices are heard as in the preceding week. Prices seem to be firmer, and are maintained at 1.30c for common iron and 1.40c for guaranteed. Soft steel bars from billet stock are a little firmer at 1.40c to 1.45c.

RAILS AND TRACK SUPPLIES.—A number of small orders for rails were taken last week, but no large business. The outlook is considerably better, and some large contracts that are pending are expected to be closed in the near future. Quotations are unchanged as follows: Rails, $29 and up; splice bars, 1.65c to 1.75c; track bolts, 2.25c to 2.45c; spikes, 1.85c to 1.90c.

BILLETS AND RODS.—The South works of the Illinois Steel Co. started up on billets and rails on Monday of this week, running double turn on accumulated orders, with practically the same wage scale as last year. The demand for billets is good, and a large tonnage was closed last week at $19.50 to $20. The rod mill at Joliet is still shut down and it has not been decided when it will resume. Rods are selling slowly in small quantities.

STRUCTURAL MATERIAL.—A very large contract, involving several thousand tons of plates for pipe work, is reported closed at the advanced prices given this week. General business is much better than a week ago, and is increasing in volume all the time. A number of large contracts are pending. Prices are made as follows: Beams and channels, 1.70c to 1.75c; angles, 1.50c to 1.55c; plates, 1.60c to 1.65c; tees, 1.70c to 1.75c. Small lots from stock are quoted ¼c to ½c higher.

PLATES.—Demand is increasing every day, and orders of 50 to 300 tons are more and more frequent. The local mills are full of orders until late in February, and are disinclined to take further business except at advanced figures. Quotations are made as follows: Tank steel, 1.60c to 1.65c; flange steel, 1.85c to 1.90c; firebox steel, 2.85c to 5c; boiler tubes, 60 to 65 per cent discount.

MERCHANT STEEL.—The large demand noted last week continues, and sales are increasing in number and size. Buyers have apparently come to the conclusion that prices are as low as they are likely to be for some time. Prices are firmly maintained as follows: Open-hearth spring, tire and machinery steel, 2c to 2.10c; smooth finished machinery steel, 1.75c to 1.80c; smooth finished tire 1.65c to 1.70c; tool steel, 5.50c to 7.50c; specials, 11c and upwards; Bessemer bars, 1.55c to 1.65c.

SHEETS.—Sales last week included several round lots of both black and galvanized. Buyers, both consumers and jobbers, are anxious to secure as long deliveries as posisble, but many mills refuse to quote except for immediate delivery. Prices are firmer and higher at 2.40c to 2.45c for No. 27 black, and 75 and 10 per cent discount for galvanized.

OLD RAILS AND WHEELS.—Several transactions are reported in wheels, including one of 50 tons at $14, one of 300 tons at $13.50 and one of 500 tons at $14. These figures represent about the range of quotations. Old iron rails are quoted at $13 to $15, and old steel rails at $11 to $12, according to length.

SCRAP.—While the immediate demand has improved only slightly, a much better outlook is reported, and dealers are expecting a large business in the near future. The following are buying quotations furnished by dealers: Railroad forge, $10.50 to $11; dealer's forge, $10; No. 1 mill, $6.50 to $7; railroad cast, gross ton, $9.50 to $10; machinery cast, $10 to $11; axles, $13.50; cast borings, $5; wrought turnings, $6; axle turnings, $7; mixed steel, $8; stove plates, $5.50 to $6; heavy melting steel, $9 to $9.50.

IN OTHER MARKETS.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

Pittsburg. The advances in Bessemer pig and steel billets noted a week ago have been followed by a week of nearly stationary prices. The market has held all the ground gained, with here and there a transaction at a higher price than was reached in the preceding week. Furnacemen in the valley continue to hold to $13 for Bessemer, and one or two sales are reported above $12.50, but buyers do not seem willing to pay above the basis established last week. We note a sale of 5,000 tons at $13.25 Pittsburg, and sales of 5,000 tons and 1,000 tons at $12.50 in the valley. The reduction of output, due to the closing of valley furnaces, is having its effect, as well as the firmness of the coke price and the acceptance of the Bessemer ore agreement as a certainty. Yet the halting demand for finished material in certain lines is a

counter influence, which makes it reasonably certain that advances in Bessemer iron and steel will not be pronounced. There is no change as to foundry iron, which is quoted at $13.25 to $13 50 for No. 1, and $12.50 to $13 for No. 2. Gray forge is in slightly better demand and sales are reported at $11 and $11.25. In steel billets there is continued activity, with $18 and $18.50 as the range of quotations by Pittsburg mills, though $17.75 Wheeling has been done the past week. With the advance in Bessemer the mills feel that a $5 difference is too little, and those that buy their iron would require an $18.50 figure. There is an improved demand for iron and steel scrap and melting steel is a trifle higher. Old steel rails are quoted at $13 and $13.25 and old iron rails at $16.50, railroad wrought scrap at $12 and railroad cast scrap at $10. The finished material demand shows little change from a week ago. The bar iron trade is quiet and the 1.20c valley price on common iron, fixed by the association is still cut as much as $2 a ton by outside mills, an Ohio mill making the lowest prices. On steel bars 1.10c@1.15c is the range. Railroad requirements are held back. Structural material is ordered in small lots. Prices are made 1.40c@1.50c on beams and channels up to 15 inches, 1.25c@1.35c on angles, 1.45c@1.50c on tees and 1.45c@1 50c on sheared bridge plates. Tank steel plates are selling at 1.30c@1 35c, shell at 1.40c@1.50c and flange at 1.50c @ 1 60c. Sheet mills vary in their quotations. Some are naming slightly higher prices and few are willing to sell for more than 60 days ahead, in view of the expected advances in raw materials. On No. 26 common sheets, 2.20c to 2.25c is the quotation; on No. 27, 2.30c to 2.35c, on No. 28, 2.35c to 2.40c. Galvanized are 75 10 and 5 per cent off. Black plates for tinning remain at $2.45. Pipes and tubes are somewhat firmer and the outlook is thought to be improved. Wire rods have advanced with billets and there is the beginning of activity after a long quiet. A sale of 1,000 tons is reported at $23.50. A sale of muck bar is reported at $20. Skelp iron and steel are somewhat improved in tone. We quote 1.35c on sheared skelp iron and 1.10c to 1.15 on grooved steel. A circular has been issued announcing that the $2 price for coke will continue through February. The curtailment of the production of pig iron has been followed by a blowing out of Connellsville coke ovens. In the week ending Jan. 18, there were 14,593 active ovens with an estimated production of 135,105 tons, a falling off of 10,975 from the preceding week and of about 19,000 tons from two weeks previous. Shipments were 6,205 cars, a falling off of 588 cars from the week preceding. Foundry coke is quoted at $2.30 at the oven.

Cincinnati. The brighter indications of last week have continued so far as increased interest on the part of buyers is concerned, but prices have not improved. Nearly all the Southern furnaces are anxious for better filled order books, and the business of responsible buyers is eagerly contested. Each contract seems to be considered on its own merits. For immediate delivery and prompt cash, decided bargains can be secured from furnaces having the required grades on hand. It is reported that one stack in Tennessee recently started, will soon blow out, and rumors are afloat that other furnaces in the South will be forced out by low prices. It can be truthfully said that the outlook to day is much more hopeful than it was 12 months ago and after the present slump has spent itself, a heavy demand at fair prices is expected. A few lots of Northern iron have been closed out at extremely low prices, but most Northern producers are unwilling to sacrifice their small stocks of foundry and forge grades. Collections have been better and money seems somewhat easier to get. While $11.75 and $11.50, Cincinnati, are the quotations on Nos. 1 and 2 Southern coke foundry respectively, these prices are being cut. Gray forge is sold at from $10 25 to $10.50.

Buffalo. Signs of an improvement are noticed. Local furnaces report having received orders during the past week for more than their output, and several large sales of Southern iron have been reported in this district. Lake Superior charcoal also improved and there has been quite a movement in this iron, owing probably to the recent advance in Bessemer. There has been considerable talk of higher prices, but as yet there has been no actual advance in anything except in the Bessemer, although those furnaces that were weak and willing to sacrifice for orders, have apparently filled up, which has helped strengthen the general market.

St. Louis. There has been enough trade in pig iron since Jan. 1 to counterbalance the dull months of November and December. Prices are somewhat lower, but there is a fixed basis which buyers find difficult to shade.

NEW LIST OF STANDARD ANGLES.

At a meeting of the American Association of Steel Manufacturers, held at Washington, D. C., Jan. 17, the following sizes of angles were established as standards:

Even Legs.		*Uneven Legs.*	
6 x 6	1¾ x 1¾	6 x 4	3½ x 2½
4 x 4	1½ x 1½	6 x 3½	3 x 2½
3½ x 3½	1¼ x 1¼	5 x 3½	2½ x 2
3 x 3	1 x 1	5 x 3	
2½ x 2½	¾ x ¾	4 x 3	
2 x 2		3½ x 3	

The maximum and minimum weights for the various sizes of angles will be in accordance with former practice, and the variation in thickness of metal will be by 1-16″. In announcing the new list, the manufacturers of angles say: "The list of standard angles enumerated above embraces all those necessary for ordinary structural purposes, and confining the designing of structures to these 20 sizes wi l insure better service and more prompt delivery to the consumer."

The above list of sizes is a material reduction in the number rolled heretofore. The Carnegie Steel Co., for example, has rolled 56 sizes.

In connection with the report in our last issue, of the conference at Washington, Jan. 18, between representatives of the American Association of Steel Manufacturers and the Board of Supervisors of Steam Vessels, an error was made as to the recommendation of the steel men concerning chemical requirements. Though a limit of 0.06 for phosphorus and 0.04 for sulphur had been discussed, the recommendation finally made was in these general terms: "This association would also recommend that your board place a limit upon the allowable contents of phosphorus and sulphur in marine boiler plate."

THE Fox Machine Co., of Grand Rapids, Mich., manufacturers of machine tools, universal trimmers, special bicycle machinery, etc., sends the following testimonial, dated Jan. 24, 1896, to Otto Goetze, 15 Whitehall st., New York, sole agent in the United States for Mannocitin: "Our test of Mannocitin was as follows: Took a small iron pulley, finished; coated one side with Mannocitin, subjected it when dry to a steam jet, turning wheel so that all sides received equal steam abuse; placed it out in the rain and snow for five days, and at the end of this time the uncovered side was a mass of rust. That portion covered by Mannocitin was as bright as new finish; it was washed off with turpentine, and the result was simply marvelous. It will prevent rust, and we shall use it in preference to anything else." A free sample of Mannocitin is sent to manufacturers and dealers on application.

THE Westinghouse Electric & Mfg. Co., of Pittsburg, has received a number of awards at the Atlanta Exposition for the handsome exhibit of the electrical apparatus made. Several gold and silver medals are among them.

THE IRON TRADE REVIEW

DEVOTED TO
IRON AND STEEL MANUFACTURE, FOUNDRY AND MACHINERY TRADES, IRON ORE PRODUCTION, TRANSPORTATION, AND GENERAL INDUSTRIAL PROGRESS.

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PIG IRON STATISTICS AND THE ORE TRADE.

The official statistics of pig iron production in the United States for 1895, printed one week ago, have many attractions for the student of recent developments in the iron industry. Probably no feature is more striking than the prodigious output of Bessemer iron, the percentage of this metal being 60 as compared with 57 in 1894, and a lower figure, year by year going farther back. The full extent of the dominance of steel in 1895 cannot be measured until its production, both Bessemer and open-hearth, is compiled, but the rapid displacement of other building materials by Bessemer steel and its expanding use in other directions can be gauged by the Bessemer pig iron figures. The following tabulation, in which gross tons are represented, is interesting in this connection:

	PIG IRON PRODUCTION IN U. S.	BESSEMER PIG IRON.	PER CENT. BESSEMER.
1889	7,603,642	3,151,414	41
1890	9,202,703	4,092,343	44.5
1891	8,279,870	3,472,190	42
1892	9,157,000	4,444,041	48.5
1893	7,124,502	3,568,598	50
1894	6,657,388	3,808 567	57
1895	9,446,308	5,623 695	60

The important fact in the above table is that in six years the proportion of Bessemer steel-making pig has changed from two tons out of every five to three out of every five. The increased output of Bessemer pig last year was most marked in the districts closest to the lakes. We do not mean to repeat in this connection what we have said on other occasions; but as each fresh publication of these statistics makes more emphatic the eminence of the Central District, that fact is the one that calls for prominence in any comment that is made. As illustrating this growth of Bessemer iron production in the Chicago district, the Wheeling district, in Ohio (outside of the Ohio river furnaces) and in Western Pennsylvania, the figures below are instructive:

PRODUCTION OF BESSEMER PIG IRON IN CERTAIN DISTRICTS.—GROSS TONS.

	1891.	1892.	1893.	1894.	1895.	Per cent increase '95 over '94
West Virginia...	84,283	154,793	81,591	80,781	141,968	75
Illinois.....	540,714	800,661	358 592	543.309	885,744	63
Mahon. Val. and Hang. Rock....	74,865	183,740	121,171	168,202	362,856	115
Miscellan. Ohio..	361,616	420,257	274,153	395,278	639,648	62
Allegheny Co.....	996,483	1,324,101	1,697,207	1,530,835	1,725,601	13
Shenango valley	177,773	176,205	402,702	341,515	684 625	100
Mis. West. Pa....	178,085	218,760	200,146	182.036	321,307	76
Totals.....	2,413,819	3,278,517	3,135.562	3,241,956	4,761,749	47

The striking fact in this table is that in 1895 the districts in question doubled their Bessemer pig iron production of 1891.

The significance of the figures for 1895 to producers of Lake Superior Bessemer ores has been anticipated in the statistics compiled for the guidance of the conferences that have been held over the problems connected with mining and selling these ores in 1896. It was estimated last fall, when pig iron production was at its height, that the consumption of Lake Superior Bessemer ores was at a rate that would use up 10,000,000 tons of these ores in a year; and this was probably close to the fact.

A careful study of Mr. Swank's statistics, in the light of approximately accurate information as to the furnace destinations of Lake Superior Bessemers, gives a consumption of these ores in 1895, of 8,500,000 tons. We include in this estimate the Bessemer pig iron product of Illinois, Michigan, Wisconsin, Ohio, West Virginia, Allegheny County, Shenango Valley and Miscellaneous Western Pennsylvania, with an allowance for Pennsylvania districts east of the Alleghenies, gauged by shipments of ore from certain docks at Buffalo and Erie. In a similar way the consumption of non-Bessemer ores from Lake Superior can be approximated, with allowances for Western New York and Eastern Pennsylvania. The result is a total of about 3,000,000 tons.

The total shipment of Lake Superior ores from the mines last year was 10,429,037 tons. The total consumption exceeded this amount by upwards of 1,000,000 tons.

This means that the year 1895 reduced the accumulation of Lake ores on Lake Erie docks by 1,000,000 tons, assuming that furnace yard stocks were virtually the same at the opening and at the close of the year. With all its prodigious production of Lake Superior ores, 1895, therefore, did much toward clearing away the ore stocks that had long been growing on lower lake docks, and paved the way for a clearer start at the opening of navigation than has been possible in a number of years.

Some slight disturbance of these calculations may result if the valley furnace suspensions of the past month are greatly prolonged. So far as the working out of the plans for 1896 on the part of the ore interest is concerned, future developments alone can suggest modifications either toward greater or smaller production than is now contemplated. But so far as the year 1895 could throw light on the situation it can be seen from the figures above that there has been no little warrant for optimistic views.

Those who have been making predictions of shipments for 1896, based on the amount by which 1895 exceeded 1894, are likely to be disappointed when the year's record is made up. It is to be considered that the importation of foreign ores has been stimulated the past year and that the better prices for the Lake Superior product have assisted also in the marketing of Eastern concentrates. All calculations come back to the demand for finished material, and that, at this writing, with one month of the new year behind us, is yet an entirely indeterminable quantity.

Personal.

Frederick E. Bruce, who has been in charge, for some time, of the New York office of the National Water Tube Boiler Co., is now connected with the Semet-Solvay Process Co., of Syracuse, N. Y., his work having to do with the establishment of Semet-Solvay retort coking plants, with recovery of by-products.

R. N. Dickman, chemist and mining engineer, has re-established his headquarters in the Atwater Bldg., Cleveland, and in the Rookery Bldg., Chicago. He will continue to make occasional trips to El Concheno, Chihuahua, Mex., where he spent several months in 1895, at the gold mine of Corrigan, McKinney & Co., of Cleveland.

The will of the late Chas. D. Arms, iron manufacturer of Youngstown, O., leaves $5,000 to be applied to the purchase of books for the public library of Youngsto wn.

THE CLEVELAND DISTRICT.—Continued from Page 3

Eastern plate contract of 10,000 to 12,000 tons for a water conduit, taken by Pittsburg, has stiffened prices and 1.35c, Pittsburg, for tank steel is now minimum with the leading mill, an advance from 1.25c. Beams and channels are still 1.40c@1.45c, Pittsburg, with several contracts pending. Angles are 1.25c Pittsburg, and though a contract was taken recently at 1.30c Cleveland, equivalent to 1.21c Pittsburg, 1.34c Cleveland is now quoted as minimum. In bar iron and steel there has been little change in the week. The Merchant Bar Iron Association, after a three days' meeting in Cleveland last week, is now in session again. An effort is being made to strengthen the organization and on the new plan, which contemplates an allotment of tonnage, several mills have been added. The association quotation is still 1.20c, though 1.10c has been done recently. Bar steel has sold at 1.20c to 1.25c, Cleveland. No billet transactions are reported in the week, though $19 is a mill quotation. Rods and wire are more active ; the former are quoted $24, Cleveland. In old material slightly better prices are realized. A sale of 800 tons of old iron rails was made at $17 in the valleyand of 200 tons at $17.25, Cleveland. No. 1 railroad wrought scrap is quoted at $12, railroad cast scrap at $10, cast borings at $7.75 and wrought turnings at $8.25.

National Association of Shafting Manufacturers.

The manufacturers of cold rolled and cold drawn shafting, who have maintained a national list and uniform prices since the organization of their association last July, held a meeting at Youngstown, O., on Tuesday, Jan. 28. There were present representatives of the Akron Iron & Steel Co., Akron O.; Compressed Steel Co., Boston; Gautier steel department of the Cambria Iron Co., Johnstown, Pa.; Cumberland Iron & Steel Co., Cumberland, Md.; Bliss & Laughlin, Chicago and Harvey, Ill.; Jones & Laughlins, Pittsburg; Union Drawn Steel Co., Beaver Falls, Pa.; Fitzsimons & Co., Cleveland; Mahoning Valley Iron Co. and Finished Steel Co., Youngstown. The above concerns, together with the Ellicott Machine Co., Baltimore, constitute the membership of the association, which takes in all the cold rolled and drawn shafting manufacturers in the country. President H. F. Holloway, of the Akron Iron & Steel Co., presided, and F. N. Beegle, of the Union Drawn Steel Co., was secretary.

The questions discussed related to prices and to the conditions at present surrounding the trade. Prices were re-affirmed and the association adjourned to meet in Boston at a date to be fixed later. The latest accessions to the association are Bliss & Laughlin, of Chicago, and the Ellicott Machine Co., of Baltimore.

AT Pittsburg on Wednesday, Jan. 29, the Union Trust Co. was appointed receiver for the Pittsburg Steel & Iron Mfg. Co., which succeeded, last summer, to the Soho works. The receivership was decreed on the petition of the Vega Iron Co., of Duluth, which had sold the company ore. The illness of Chas. F. Stuart, vice president of the company, and of President James Andrew, is the cause of the embarrassment. Another cause was the breaking of the shell of the blast furnace, which has been idle pending a $12,000 expenditure for repairs. The trouble is expected to be only temporary. The indebtedness of the company is said to be $130,000. There is stock on hand worth $70,000, and contracts calling for $30,000 worth of work. During the past month $62,000 of the indebtedness has been paid off.

C. F. EVANS STEEL & IRON CO., Cincinnati, has been given charge of a branch office of Lindsay & McCutcheon, of Pittsburg, recently established at 22 W. Second st., Cincinnati. In announcing the arrangement, Lindsay & McCutcheon say that the purpose is to give their customers in Kentucky, Southern Ohio & Indiana early attention to their inquiries and orders.

Active operations will begin in the spring on the Sheridan mine of the Oliver Mining Co. near Hibbing, Minn.

LAKE SUPERIOR IRON MINES.

Welcome Hyde, of Appleton, Wis., fee owner of the Cuff mine on the Menominee range, has arranged for the operation of the property, and machinery will be put in place at once. The ore is 45 in iron and very low in phosphorus and can be mined cheaply.

The new triple expansion Worthington pumping engine installed at the Pewabic mine is working satisfactorily. It is 15, 23 and 38 x 12 and 24 and has a capacity of 1,500 gallons a minute, lifting 800 feet.

The annual meeting of the stockholders of the Aurora Iron Mining Co., held at the office of Howard Morris in Milwaukee, Jan. 21, resulted in the election of the following directors: F. T. Gates, James C. Colgate, Charles L. Colby, Charles F. Rand, of New York; Edwin H. Abbott, of Cambridge, Mass.; L. H. Severance, of Cleveland; W. J. Olcott, of Bessemer, Mich. The present officers were re-elected: Charles F. Rand, president and treasurer; Howard Morris, secretary and general solicitor.

The Webster, Camp & Lane Machine Co., of Akron, O., has just put in a fine hoisting plant at the Pabst mine for the Metropolitan Iron and Land Co. The plant consists of a 24x48 Corliss engine, capable of furnishing 300 h. p. Two ten-foot drums, each large enough to carry 1,500 feet of wire rope, with fourteen foot gearing, constitute the hoisting apparatus. The engine has a sixteen-foot fly wheel. This plant will operate the skips in No. 2 and No. 4 shafts.—[News-Record, Ironwood, Mich.

The fee-owners of the Barasa mine, at Negaunee, Mich., have reduced the royalty on its ore from 35 to 25 cents a ton and operations will be resumed.

At the old Colby property on the Gogebic range, operations have been suspended, pending the adjustment of the royalty.

A Negaunee, Mich., dispatch says, that the Buffalo mines there which closed Jan. 1, because the fee-owners proposed to return to the old royalty which had been reduced in the past two years, will probably resume Feb. 1. The fee-owners have made concessions which will permit of this step.

At the annual meeting of the Metropolitan Iron & Land Co., at Milwaukee, the directors and officers were re-elected. The appointment of a superintendent to succeed the late J. D. Day was left with President Curry.

The Lake Superior Consolidated Iron Mines have secured an option on the Mesabi Chief property, 12 miles west of Hibbing. The price talked of is $150,000.

In an article on the Republic mine *Iron Ore* of Ishpeming, Mich., says: "The promising end of the mine is to the north, and here there is good evidence that the company will be able to secure a healthy product for many years to come. With no royalty to pay, with all the advantages to do mining with, and with a cheap power and an excellent ore, there is no reason why dividends cannot be kept up. It may be that the company will decide to crush its ore. If this conclusion is reached, the New No. 9 shaft offers excellent opportunity for sucha reduction plant. The collar of the shaft is 42 feet above the railroad track, and there is plenty of room on the level ground about the shaft to give place to the crushers with but little work in preparing a foundation."

The annual meeting of the Chandler Iron Co., changed from May to January, was held last week. A dividend of $3 per share of $25, payable Feb. 1 was declared. The present force at the mine is 630 men and this will be increased.

At the Zenith mine the main shaft is to be sunk another level. The machinery is being overhauled and ore will be raised in a short time.

The Duluth & Iron Range Road has ordered six new locomotives for its ore traffic. Work on the new 1,000-ft. double dock at Two Harbors has begun.

The Consolidated Co. is confining its operations at present to the Adams, where a new No. 2 shaft has been started for mining by the milling system; the Lake Superior Iron Co. properties near Hibbing, and the recently optioned Rouchleau-Ray 80-acre tract, at which thorough exploratory work is going on, with results so far quite satisfactory.

THE Sharon Iron Co., Sharon, Pa., will build a block of retort coke ovens at their furnace, using the Semet-Solvay system.

COMBINED PUNCH AND SQUARING SHEAR.

A general purpose tool for trimming, squaring and slitting sheets, for cutting square or triangular holes in sheets and for cutting bar iron has been brought out by Bertsch & Co., of Cambridge City, Ind., and is shown in the illustration. Its special adaptations are to the shearing and punching done by range makers, heavy sheet iron workers and coppersmiths.

The machine is made in six sizes, with either 12, 15 or 18-in. throat punch, to punch a ⅜ hole in ¼-in. iron, and with strengthening bolt, a ½-in. hole in ⅜ iron. The knives are 27, 33 and 39 inches long, so as to cut 24, 30 and 36 inch sheets of Nos. 10, 12 and 14 gauges crosswise in one cut. By the use of the squaring gauges this is accurately done without marking off, and for cutting sheets lengthwise the squaring gauges need not be removed from the table. The squaring gauge S is flattened in front and is set back from the blades so as to allow the sheet to be shifted for continuous cutting in trimming and slitting.

The quick-operating hold-down H holds the sheet securely on the table without removing the squaring gauges. The hold-down can be adjusted so as to be self-locking when down, and self-supporting when up, as shown in the cut. The squaring gauges are secured with one bolt, and can be removed if desired. The shear is provided with the usual set of squaring shear gauges, and can therefore be used for cutting metal accurately by the gauges, the same as a squaring shear. With the compound lever this shear will cut much heavier stock,

and more easily than is possible on the old style treadle squaring shear. It is also more durable, being much stronger and with fewer wearing parts, and will do work more rapidly and satisfactorily than is possible with the old style stock shears or bench shears.

The shear with 27-in. blades will cut No. 12 gauge the full length of the blades; and by cutting one-half the length of the blades, it will cut No. 10. With 33-in. blades, it will cut No. 12 gauge the full length of the blades; and No. 10 by cutting 24 inches at a time. With 39-in. blades it will cut No. 12 gauge the full length of the blades, and No. 10, 24 inches in one cut, or No. 8, 18 inches in one cut. With the strengthening yoke attached in front, to prevent springing, it will cut two gauges heavier. This has 12, 15 or 18 in. throat, so as to slit a 24, 30 or 36-in. sheet. It is placed on the rear side, in front, to admit of sheets being cut crosswise. The shear will also cut bar iron up to ⅜x3-in. or ⅝-in. round. It is made extra heavy, if desired, for cutting two or three gauges heavier than stated.

The left side of the main body of the casting, at the rear of the blades, is provided with a special adjustable parallel trimming gauge, in line with the blades, which properly guides the sheet in continuous cutting and makes sure that the second cut is in line with the first.

The machine is also especially adapted to cutting square or triangular holes in large sheets, by attaching a short blade on the front or outer end of the knife-bar. This blade is from four to eight inches long, and is attached with two bolts, and can be conveniently removed or set back on the knife-bar, if desired, to cut holes in small sheets, but is preferably used at the end of the bar or knife-seat for cutting holes in large sheets. By punching a slot in the corner of the opening desired to be cut, the metal to be removed is more conveniently cut without marring the corners at the last cutting end of the blade.

The No. 27 machine, with the four-inch blade, arranged as stated, will easily cut a hole 20 inches from the edge, or in the center of a 40-inch sheet, of No. 10 gauge. The No. 33 machine will cut a hole 27 inches from the edge, or in the center of a 54-inch sheet. The No. 39 machine will cut a hole 33 inches from the edge, or in the center of a sheet 66 inches square. Heavier machines, with greater capacity, are made to order.

Special punches and dies for punching out corners can also be furnished. For punching the corners of holes to be cut in large sheets, the machines are made with extra deep throat punch. The machine is preferably made with a 15 or 18-in. throat punch, and is complete with front and back gauges, and three sets of dies and punches.

The punch is also provided with adjustable back gauge and adjustable side pin gauge, the use of which enables the operator to punch holes of equal distance from the edge and equal distance apart without marking off. The bearing of the punch plunger is adjustable to compensate for any slight wear. The punch plunger and eccentric shaft are made of steel, with brass box, and the adjustable die-seat is steel. Being small, it is well adapted to punching angle iron, flange iron and the like.

Chicago's Proposed Engineers' Club.

A preliminary meeting of promoters of the proposed technical club of Chicago was held last Friday in the rooms of the Western Society of Engineers. The committee on organization reported that three more than the necessary 150 names had been secured, and they were ready to turn all the papers and signatures over to the club. It was decided to limit the further acceptance of applications for charter membership to those originally invited to join, and to those who sent in their applications before Feb. 4. A committee on rules, by-laws, charter and organization was appointed, and one on quarters. A proposition was presented by the Great Northern Hotel, offering a floor of its new building for quarters, at a stated rental, and this was referred to the committee on quarters.

An estimate which had been made by the original committee on organization respecting the income and expenses of the club for the first year was presented, showing that a very good start could be made with a membership of 150.

After some discussion the meeting adjourned to Friday, Jan. 31, 3 P. M., at the rooms of the Western Society of Engineers, Monadnock block, Chicago. It is altogether likely that the efforts of the gentlemen starting the movement for this club will be successful, and that it is only a matter of a short time before Chicago will have a club composed of members identified with engineering interests, which will be a headquarters for engineers and their friends. This is something that has always been lacking in Chicago, and from the interest shown by the prospective members of the Technical Club, it is one that will be of immense value to the engineering fraternity.

IN *Scribner's* for February is given the tenth instalment of President Andrews' history, called "The Neo-Republican Ascendancy," which describes the close of Cleveland's first administration, the campaign of 1888 and Harrison's victory. Other topics are the Billion Dollar Congress, the McKinley Bill, the Johnstown flood and the lynching of Italians in New Orleans. The illustrations are made from contemporary photographs and are very realistic. The leading article of the number is on the Colorado Health Plateau by Lewis Morris Iddings. "The Ascent of Mt. Ararat" in Armenia is graphically described by H. F. B. Lynch. The second instalment is given of J. M. Barrie's serial, "Sentimental Tommy."

THE stockholders of the Junction Iron & Steel Co. at a meeting held at Wheeling, W. Va., on Jan. 16, elected the following directors: Henry K. List, James W. Paxton, David Gutman, J. J. Holloway, M. J. Urquhart, A. S. List and George A. Dean. Owing to the illness of President Priest, he declined re-election. M. J. Urquhart was elected president and general manager, and George A. Dean, secretary and general superintendent.

NATIONAL ASSOCIATION OF MANUFACTURERS.

On Thursday, Jan. 23, the third day of the convention of the National Association of Manufacturers, at Chicago, the first business was the election of officers for the ensuing year. A nominating committee had previously been appointed, and their nominees were unanimously elected as follows: Theodore C. Search, of Philadelphia, president; Robert Laidlaw, of Cincinnati, treasurer; and E. P. Wilson, of Cincinnati, secretary. Vice presidents from the various States were nominated by the delegations from the States, and were elected as follows: H. L. Story, California; W. Hastings, Delaware; J. B. Kirk, Illinois; J. B. Hoard, Michigan; L. D. Kingsland, Missouri; B. Atha, New Jersey; T. P. Egan, Ohio; J. H. Converse, Pennsylvania; F. W. Sivia, Wisconsin; Pliny Jewell, Connecticut; J. F. Hanson, Georgia; P. E. Studebaker, Indiana; E. W. Lovejoy, Massachusetts; M. C. Peters, Nebraska; Warner Miller, New York; L. D. Cole, Oregon; C. D. Mitchell, Tennessee. The officers and vice presidents of the association from the executive committee.

President Search made an inaugural address in which he strongly advocated a return to a higher protective tariff; reciprocity treaties with certain countries; and the building of the Nicaragua Canal by the Federal Government.

The following resolution was then presented, and adopted without discussion: Whereas, Certain State laws impose upon so-called foreign corporations created by authority of other States conditions sometimes severe and often inequitable upon which alone the said corporation may do business in the States having such laws in operation, *Resolved*, That the executive committee be requested to consider what action, if any, should be taken to prevent such obstruction of traffic between the States of this Union."

A resolution was then adopted as follows: "Whereas, The merchants and manufacturers of the country are practically unanimous in the opinion that a classification of freights, which would be uniform throughout the United States, would tend to simplify freight rates and make them more uniform, just, and stable; and, Whereas, While this is acknowledged to be true by most of the carriers themselves, the experience of the last five years shows that no relief in this direction can be looked for from them, since the adoption of such a classification, arranged by a large committee of their ablest freight men, representing all the different interests, was defeated on account of the jealousies of some of the leading carriers; therefore *Resolved*, That the National Association of Manufacturers of America respectfully and earnestly petitions the Congress of the United States to authorize and direct the Inter-State Commerce Commission to prepare, or cause to be prepared, at the earliest possible time, a classification of freight, which shall be uniform throughout the United States, and to order the same to be put in effect Jan. 1, 1897, on all the railroads in the United States engaged in inter-State commerce.

The following resolution, accompanied by long statistical documents, which were not read, but ordered printed, was introduced: *Resolved*, That it is the sense of this convention a Department of Manufactures be established under a Secretary of equal rank with the Secretary of Agriculture. *Resolved*, That the Executive committee is instructed to take such steps as may best speedily accomplish said object. It was carried without discussion. A resolution was passed asking the Executive committee to appoint the following sub-committees: A committee to place expert commercial agents in all markets covered by the agents of the National Board of Trade of Great Britain; the order for procuring said representatives is suggusted as follows: Mexico, Africa, Australia, China or Japan, Central and South America, and the West Indies. The conditions of free services of this agent to the members of the National Association of Manufacturers to be formulated and issued to all manufacturers. Second, a committee on publications, to supply the members of this association with statistics and other information tending to educate the members concerning the present movement. Third, a committee to secure such legislation as will create a new member of the cabinet, to be known as the Secretary of Manufactures. Fourth, a committee on the establishment of treaties of reciprocity which, if necessary, shall visit certain of the republics south of the United States. Fifth, a committee on the home market to consider questions of the national revenue which affect manufacturers. Sixth, a committee on ways and means for the work of this association.

A resolution was adopted requesting the United States Senate to pass promptly and send to the President the emergency revenue bill recently adopted by the House.

A resolution was adopted urging upon Congress the necessity for larger appropriations and a more liberal treatment of the Consular Service.

After an address by Senor Gonzalez, of Mexico, a resolution was adopted empowering the President of the association to appoint a committee of three to investigate as to the feasibility of making exhibits at the industrial exposition, to be held in the City of Mexico, with the co-operation of the Mexican Government, and authorizing the executive committee to take final action upon the report of this sub-committee. Philadelphia was chosen as the meeting place for next year and the convention then finally adjourned.

A SUIT AGAINST THE ILLINOIS STEEL CO.

Attorney-General Maloney, of Illinois, has brought quo warranto proceedings in the Cook Co. circuit court against the Illinois Steel Co., and in the Will Co. circuit court against the Joliet Steel Co., for a revocation of their charters of incorporation. The proceedings have been brought on the ground that the companies have exceeded the power granted them by the State, by consolidating their interests and otherwise assuming rights in direct violation of the statutes. The petition refers to the North Chicago Rolling Mill Co., which was granted a charter by special act of Legislature in 1869, to carry on the business of smelting iron and other metals, and to sell the product, with a capital stock of $1,000,000, and the right to increase this to $3,000,000. It is charged that this company effected a consolidation with the Chicago Rolling Mill Co., and the purchase price was paid in stock.

In May, 1889, the Union Steel Co was taken in and the three companies were formed into a new one known as the Illinois Steel Co. Articles of incorporation were secured and the capital stock was fixed at $25,000,000. Of this amount $3,486,000 was paid to the Union Steel Co. and $9,510,000 to the North Chicago Rolling Mill Co. The Illinois Steel Co. assumed all the debts, contracts and privileges owned by the three companies. The Attorney-General alleges that the new company in increasing its capital stock, making it larger than the combined amount allowed the three companies out of which it was formed, violated the act regulating the consolidation of corporations. This expressly specifies that the rights of any consolidated corporation shall not exceed those of the several organizations out of which it is formed.

The petition goes on to say that the law was again violated when the capital stock was increased to $50,000,000, and that the Illinois Steel Co. exceeded its rights in the purchase of real estate in Illinois and in Virginia, where it is declared the company holds property in excess of the amount absolutely necessary for conducting its business.

The Attorney-General asks permission to file a petition against the Joliet Steel Co., and states that this corporation was formed with a capital stock of $1,000,000, which was increased July 18, 1881, to $2,000,000, and April 6, 1886, to $3,000,000. It is alleged that the Joliet Steel Co. purchased a large number of city lots near its plant and in addition bought real estate in Cook Co. and in Virginia. Buildings had been erected and 354 cars for carrying the product were bought. The company continued in business until May 4, 1889, when, it is alleged, the officers of the company executed a deed for "the pretended consideration of $4,626,600." This deed was made to the Illinois Steel Co. It conveyed the plant of the Joliet Steel Co. together with all its real estate, interests in any operating contracts, privileges, franchises and concessions. All the stock of the company was turned over to the purchaser. Possession was given and the Joliet Steel Co. ceased to manufacture iron. Payment, it is alleged, was made in stock.

The filing of the suit does not seem to have caused any anxiety on the part of the officers of the Illinois Steel Co. John W. Gates, president of the company, stated that the company has never violated the law of Illinois in any of its actions, and that all of its business has been transacted in such a way and under such legal advice as to leave no doubt as to the legality of the transactions. Mr. Gates said that the officers of the company do not look at this petition in a serious light.

IRON ROOFERS AND EXPORT TRADE.

The building up of export trade in the manufactured products of the United States was a foremost question in the Chicago convention of the National Association of Manufacturers last week. Moreover, it is a question that is getting increasing attention from manufacturers in all lines. At the annual meeting of the National Iron Roofing Association at Cincinnati, Jan. 8, one of the most important sentiments responded to was "Possibilities of Export Trade," this being assigned to Mr. John A. Topping, secretary of the Ætna-Standard Iron & Steel Co., Bridgeport, O. The speaker was of the opinion that it is vain to hope to do much in export business on roofing materials, except possibly on some specialties not to be had in other markets. On such goods, he said, we undoubtedly could secure our prices and influence some trade, but in respect to standard roofing materials, such as corrugated iron and other forms which may be had in most of the markets, it would hardly be possible to get costs down sufficiently low to meet the competition we would necessarily have to face from continental countries whose labor is much below what we can possibly hope to secure. Again, it would be almost vain to hope for such a reduction in price on black sheet iron and sheet steel, which is the roofer's raw material, as would place us in condition to meet foreign prices. When it is remembered that the cost of sheet iron and sheet steel is so largely determined by the rolling mill wages paid in this country, which are so much above the cost of similar labor in both England and Germany, it would require an entire revolution in our wage system to put the mills supplying sheets in a position to make any radical difference in the cost of roofing sheets. So long as the present American wage system is maintained, and so long as labor is paid prevailing rates in general lines, it would be a useless effort on the part of rolling mills to attempt to reduce labor in that line to a competitive basis of compensation.

Under the circumstances the speaker believed that the only way possible to build up an export trade and maintain the benefits of the prevailing wage system would be through the influence and protection of reciprocity treaties with the countries to the south of us, Mexico, Cuba, and the South American and Central American States, whose labor is largely agricultural, who naturally would be the greatest consumers of our goods, and with whom we would be in better shape to make a reciprocal exchange of products. There is no doubt that we would be able, under the influence of reciprocity, to work up a large trade in building materials of the character produced by members of the Iron Roofing Association. It would require, however, before even these markets could be successfully invaded under reciprocity, that special attention be given to the needs of the trade. We would have to inform ourselves more thoroughly as to the requirements of these people, and establish agencies in the different countries to distribute the products. On account of our proximity to the markets in question, we naturally would enjoy some advantages over our competitors, as the question of time in transit and promptness in delivery is always a consideration in materials used for construction, which usually when wanted are wanted quickly.

Other sentiments responded to were the following: "Pioneer Manufacturers," Geo. E. Needham, Cleveland; "National Iron Roofing Association," T. C. Snyder, Canton; "Co-operation the Order of the Day," Chas. Aldrich, St. Louis; "Future of the Iron Roofing Business," Chas. H. Conner, Louisville. "Monroe Doctrine, as applied to Rolling Mills not working with the Assoction," H. P. Lloyd, Cincinnati. At the business meeting of the associatian, a paper by J. G. Battelle, secretary and treasurer of the Cincinnati Corrugating Co., Piqua, O., discussed the work of the association in the past six months, and went into phases of its operations, demonstrating the value of the plans adopted and indicating lines on which the usefulness of the association could be increased.

The election of officers resulted in the choice again of secretary Geo. M. Verity, of the American Roofing Co., Cincinnati, who has served the association well since the Cleveland meeting. Jos. Biechele, of Canton, was re-elected president, and C. H. Conner, vice president. The executive committee is composed of C. H. Conner, J. G. Battelle, G. E. Needham, J. E. Annis, Alex. Glass, Jos. Biechele, Charles Aldrich.

PUBLICATIONS RECEIVED.

The Buffalo Forge Co., Buffalo, N. Y., is sending out two phamphlets, "A French Iron Foundry in 1789" and "Air as an Industrial Factor." The former, in contrast with the 18th century method, presents illustrations of 20th century outfits. The latter shows applications of the fan system to heating and ventilating and to dry kiln operations. Every iron foundry and every important industrial plant in the United States and Canada will receive one of these circulars in the next few weeks.

Vol. 1, No. 1 of *Home Study*, a monthly elementary journal for students in various engineering lines, in architecture, plumbing, mechanical drawing, etc., has just been issued at Scranton, Pa., under the auspices of the Colliery Engineer Co. The object of the new monthly is to supply the needs of those who have not had preliminary education requisite to undertaking courses in technical and correspondence schools and night schools, and to help imperfectly educated readers of technical literature to acquire such a knowledge of mathematics, physics and drawing as will secure for them the best results. In this initial number, the lessons are on mechanical, steam, civil, mining and electrical engineering, etc., and cover 24 pages. As an adjunct of the correspondence schools that have enlisted so many thousands in supplemental individual work, *Home Study* has excellent promise of popularity.

Speidel & Roeper, of Reading, Pa., in a catalogue of 30 pages, describe Speidel's economic safety hoists, portable derricks, overhead tramways, hand-swing cranes and traveling cranes. The portable chain hoist has a hand chain wheel, driving two spur wheels to operate a sprocket wheel carrying a lifting chain at a velocity ratio of about 50. A list of users of the hoist is printed, with letters from some of them.

The Betts Machine Co., Wilmington, Del., devotes a late catalogue to their planing machines, illustrated with half-tone views of some of the larger sizes.

The improved Worrall friction clutch system is the subject of a handsomely printed pamphlet just published by the American Tool & Machine Co., 302 Federal st., Boston. The makers say that 1,000 clutches of this type have been furnished. "They are operated with motive power running at full speed, and will gradually start or stop any connected shafting and machinery without sudden strain upon belting or gears. The friction surfaces are flat, and when clamped together form a vacuum having pressure of atmosphere in addition to the levers to force it together."

In a catalogue of 52 pages, the Scientific Machinist Co., Cleveland, describes in detail the courses and methods of its Institute for Home Study in Engineering. The benefits of the correspondence method are explained and the various lines of work are outlined. Electrical engineering is given prominence. The apparatus employed in this department is illustrated and specimen pages are given of the instruction text furnished pupils. The Scientific Machinist School has made rapid progress and was never better organized than it is to-day.

The Standard Boiler Co., Marquette Bldg., Chicago, devotes several full page illustrations in its late catalogue to views of installations of its boilers and of some large shipments of headers and sections and drums recently made. These boilers are fitted with purifying chambers, large enough to admit of a deposit of 90 per cent of the scale forming salts.

The Prentiss Tool & Supply Co., New York and Chicago, recognizes the importance of the bicycle repair shop as a new industrial factor, by issuing a catalogue devoted entirely to tools required in this work. There are 48 pages, with plentiful illustrations. The same company has in preparation a more complete catalogue calculated to circulate among the larger repair shops and those devoted also to manufacturing.

Dixie, of Atlanta, whose pioneering effort brought about the Cincinnati meeting at which the National Association of Manufacturers was organized, sent out an original souvenir of the Chicago convention of last week. A cotton boll, neatly encased in a pasteboard box, is enfolded by cards bearing cotton-field and a cotton-gin view, and the familiar figure of "the best cotton picker invented up to date."

WIRE ROPE HAULAGE, ITS USE AND ABUSE.*

BY T. E. HUGHES, M. E.

For underground haulage, there are to-day, generally speaking, three systems in operation in the bituminous coal regions of this country: 1st, the tail rope system; 2nd, the endless rope, and 3rd, the electric system. Each system has its good points as well as its weak ones; and no engineer or coal operator should let any influences have a bearing upon which method he will adopt other than those produced by the conditions as he finds them at his particular plant.

A general rule to be observed by all as to the manner of operation would be one of the worst things to meet with in coal mining. Let me right here quote literally from an article read before the mining engineers of Western Pennsylvania, as follows: "It is very essential in deciding which system of mechanical haulage is best adapted to any particular mine, to carefully consider all the conditions to be contended with."

This vital point that is here reiterated covers the true secret of a successful haulage system, be its manner of operation what it may. Hence you will see that any remarks of the author of this paper will have to be considered in a general way, produced by observation of various plants working under very dissimilar conditions, and the suggestions being of a general nature and not applicable to any particular plant until first the conditions of said plant have been care fully studied out.

Generally speaking, a tail rope system produces more satisfactory results than the endless rope system. First, we can use a tail rope system in single gangways by carrying the tail rope between the tracks, alongside the track or overhead. An endless system (generally speaking), calls for a double gangway, to produce economic results; *i. e.* the carrying in of empty cars at the same time the loaded ones are being taken out. This is the first reason why the writer would advocate (where the plant admits of so doing) the use of a tail rope system.

The next reason, and it cannot be considered too carefully, is the objectionable feature of the endless system, *i. e.* friction. Friction, reduced down to mechanical results, means nothing more nor less than wear and tear at points of contact; and if said friction or wear and tear must produce the moving or grasping the load we propose carrying, it certainly means wear and tear of something, at some point.

There are several methods of fastening to or attaching the loaded train of cars to the endless system; one being two pulleys mounted on a small truck, each nearly touching the other at the face of said pulleys or sheaves when out of service; the shafts carrying these two pulleys being connected together by a right and left hand screw. When said screw is revolved it widens the distance between the pulleys, and the endless rope being passed around said pulleys becomes taut, friction accrues, and eventually by friction the rope takes a permanent grip on the pulleys and the train is moved.

Another system, and one more commonly used, is to mount on a small truck a device working on the principle of a vise operated by a screw. This, again, by the closing of the vise, makes contact with the rope, which, when the friction has been overcome, makes the attachment a permanent one, and the load moves.

In operating a wire rope, be it for haulage or other purposes, avoid friction as you would poison. If for no other reason, I would, at all times, advocate putting in a tail rope system for the foregoing reason, even if no other reasons or conditions warrant so doing. A tail rope system, properly put in, with a boiler capacity and power of engines being 25% in excess of any possible requirements, will, in nine cases out of ten, produce the greatest result for the capital invested.

It may have occurred to some of you by this time that I have not referred to the fact that a tail rope system calls for about 50% more rope than an endless system. True. But actual experience by the rope makers, I think, will demonstrate the following to be a fact: Conditions being equal, two plants side by side, going into a heading 10,000 feet from the power house, with a tail rope system calling for 30,000 feet of rope, and another with an endless system, like distance and under like conditions (if such a plant ever existed), would result in the tail rope lasting twice as long as the endless rope, producing a saving of 33% on rope bills, where 50% more rope is in operation—this coming from the necessity of replacing the endless rope twice as often as the tail rope.

Let me now refer to one or two tail rope systems working under favorable conditions that have produced very satisfactory results, and in a general way, could and should be duplicated anywhere else in the United States, where the coal to be handled would warrant the investment.

First, there is a plant within 25 miles of Pittsburg, operating the tail rope system, the length of haul being 10,500 feet. This, as you see, calls for 10,500 feet of main rope and 21,000 feet of tail rope. Their engines are 14x24; drums six feet in diameter. They work under 80 lbs. steam pressure; they haul a maximum of 90 cars per trip, loaded as follows: Coal, 4,000 lbs., tare 1,300 lbs., gross 5,300 lbs. There is but little gradient and that is a maximum of 1½% against these empty cars, *i. e.*, in favor of the loaded cars. They make 16 trips, and it takes 40 minutes to make a trip. The engines are geared four to one. They use for the track a 30 lb. steel rail well ballasted. Rollers are 20 feet apart. The road bed is on a coal bottom, under which is a hard fire-clay, and under this fire-clay a limestone. This, as you will see, gives what might be termed an almost ideal condition for a roadbed in a coal mine. The mine is well drained to the opening or openings.

Again, I have in my mind's eye, a plant within 200 miles of Pittsburg. The engines are 20x30; they are geared three to one; they develop 450 h. p. while hauling the trip of 40 cars up a grade of one in 20. The gross tonnage of load is 234 tons 880 lbs. divided as follows: Coal 160 tons, cars 60 tons, weight of rope 14 tons 880 lbs. The haulage is 9,000 feet from the heading to power house. They use a 1⅛″ hauling rope, and a ¾″ tail rope. One of the main ropes on this latter plant is still in service, and its mate was taken off this last summer. I forgot to state that this is a double tail rope system. The main rope and tail rope taken off last summer hauled 1,200,000 tons of coal. Consequently you will find, by a short process of figuring, the cost of the rope per ton of coal hauled.

The plant first referred to does not have any conditions of grade to speak of; in other words, the maximum grade is 1½% in favor of the load. They have hauled out over 1¼ million tons of coal with 30,000 feet of ¾″ crucible steel haulage rope, costing as you will see 2, 4-10c. per 1,000 tons for haulage.

Having now referred to a couple of plants hauling coal with favorable commercial results, I now want to switch back again to general conditions to be observed for operating rope haulages, be they endless or tail rope. Perhaps one of the most vital and beneficial changes that our engineers have made is that where we have to make a turn in our gangway at a right angle (or nearly so), they now, wherever it is possible, introduce the reverse curve to overcome the strain resultant from using a guide wheel or carrier. By using the reverse curve, you can see at a glance, we get a much greater radius, and naturally much less bind or set in the rope, than under the old conditions. Observe that the mine engineer will reverse the conditions of the steam railway engineer in the following way: Your inside rail must be elevated above the level of your outside rail, owing to the fact that the pull of the rope will have a tendency to increase friction if the rails are on a level, while on the contrary it is a question of momentum to be overcome when a railroad engineer of a steam road elevates the outside track instead of the inside, as the mining engineers do.

It will not do to leave the discussion without noticing another important factor in a well equipped plant, the kind and construction of the rope that you use. The kind most commonly used for haulages is composed of six strands of seven wires each laid around a hemp center. The wires, generally speaking, are of steel. A rope that has received more attention than it merits is what is known as the "Lang-Lay" rope. This rope is composed of the same number of wires and strands as the commonly used haulage rope, but differs in this respect. The strands when being twisted together are twisted in the same direction as the wires have been in each particular strand. This produces a much more flexible rope than the rope made in the way known as standard lay. The

*Read at Columbus, O., before the Ohio Institute of Mining Engineers, Jan. 21, 1896.

strands in the standard laid rope are laid up in the opposite direction to the lay of the wires in the strand.

A flexible rope is a desirable one, if we do not sacrifice some element of vital force equal to or greater than what we gain in flexibility. There are exceptional cases (which the discussion of this paper may bring out) in which the lang-lay rope is the most advisable, but generally speaking the lang-lay rope does not give as good service as the standard lay.

By examining a section of a lang-lay rope, you will see that the wires run over the pulleys at an angle of about 45 degrees. If every pulley is in an ideal condition, *i. e.* running true, well lubricated, and in first-class condition, the construction of the rope will not make a material difference in the life of the same, but, are these conditions ever lived up to? We say "no;" consequently, at just exactly the ratio of the condition of the passing from the ideal to the actual, at that ratio does friction come in in the wear of the wires on the lang-lay rope over and above what would be the case with the standard lay.

To further illustrate this, you will notice that when a mechanic is using a file in filing a piece of metal, he takes the position of the file at exactly the same angle at which these wires are laid to produce the best results, *i. e.*, the angle that will cut or wear away the metal to the greatest amount with each stroke of the file. If the mechanic will do it with that object in view, does not the same result follow with the lang-lay rope, when passing over the pulleys full of grit and dirt. Such being the case, rope manufacturers, generally speaking, recognizing this fact, have insisted on the use of the standard lay rope to produce the best results for the operator. You will notice in the standard lay rope, that the wires lie parallel with the motion of the rope, and for this reason when passing over pulleys expose the smallest amount of surface of each wire for friction that is possible, and by so doing has a tendency to slide over the pulleys rather than scrape them.

Again using the file for an illustration; if you put the file in the mechanic's hand, and tell him to push it over the metal he is filing, with the teeth of his file parallel with the motion of the stroke, he will at once tell you that his file will slide over the material instead of cutting it. This illustration will best serve my purpose, in indicating why the lang-lay rope will not give as good service, generally speaking, as the standard lay. There are, as I have intimated, exceptional cases where the lang-lay rope will work, but only exceptional, they being perhaps controlled by the following conditions: A high speed motion, very small drums, and numerous angles in the operation of the plant.

Under these conditions perhaps it might be advisable to use the lang-lay, on account of its extra flexibility over and above the ordinary haulage rope made of seven wires to the strand; and even in this condition, it is a question which only a rope manufacturer should decide, as to whether a rope made of 19 wires to the strand, standard lay, would not give better service than a rope made lang lay seven wires to the strand. This illustration once more forces upon us the fact that friction is an expensive luxury, and only those who need not care what the expense of the luxury is should ignore its cost.

Before leaving the subject of haulage, we might be considered behind the time if we made no reference to the latest development, namely, electric haulage. Electric haulage, as being introduced to-day, means haulage by traction; and, getting back to our old hobby again, traction means friction. The problem—a simple one—is, to move a given load (the power needed it is presumed we have at our command) by a sufficiently heavy motor to give us the required traction in other words, sufficient to reduce the friction between the motor wheels and the rail to nil. This, after careful investigation, I am firmly convinced has, as yet, not been successfully accomplished, looking at the question of commercial economy and success.

Of course I realize that this remark will bring down on my unprotected head an avalanche of criticism from our electrical engineers, yet I will frankly say right here that if I am mistaken, I am as anxious as they are to see the error of my ways, and only too gladly will make due apologies, and concessions for such discrepancies as they may point out to me. But, as I now see it, there is not in operation to-day, to my knowledge, an electric haulage system giving the desired mechanical results, that I would not be willing to guarantee to exceed said mechanical results on less than 75% of the capital invested in the electric installation, by substituting wire rope. If this is so, electricity is as yet, economically speaking, a failure.

Let me close these remarks by suggesting that some of the rules that are given us for success, when seeking happiness, will apply with equal force in seeking coal: Avoid friction. Take the best of care of the health of your plant. See that all thinge work in harmony. See that the joints are well lubricated. See that each part of the plant performs its particular duty. See that it gets the daily care that it should have to enable it to do to-morrow's work as ably as it did to-day's, and rest assured it will live to a ripe old age, and make all happy who come in contact with it.

THE MILLER GAS ENGINE.

The gas engine manufactured by the Miller Gas Engine Co., at Springfield, O., is attracting the attention of power users, particularly in flouring mills, electric light and foundry lines. Several points radically departing from other gas engines make a description of this engine, as shown in the illustration, of general interest. The pneumatic governor is the principal distinctive feature of this engine, and in all its details it illustrates the wonderful advancement in gas engines since vapor or gas has been utilized for motive power. Its action is instantaneous. Working in connection with peculiarly constructed valves, it is so quick and accurate in its action, that a charge of gas and air, large or small, is taken in the explosion chambers each revolution, of exactly the dimensions required to keep up the speed in uniformly regular motion. It other words, the gas and air are throttled in the same ratio by the governor so as to maintain the proper mixture, thus securing perfect combustion and hence the utmost power that can be secured from each explosion.

The gasoline attachment is controlled by the governor in the same manner as the gas. The gas or gasoline is turned on the engine to its fullest capacity, without regard to the size of the supply pipe. The governor regulates the quantity taken for each compression, and the engine misses no explosion. If but little power is required to keep up the speed, the amount of gas or gasoline is diminished to the required dimensions. A 50-horse power engine, carrying a load of but 10 horse power, can be run as economically, as far as the consumption of fuel is concerned, as a 10-horse power engine working up to its full capacity, excepting only the increased friction of the larger machine.

This, it can be seen, is an important feature. Fifty or 100-horse power may be required only a part of the time, while much less power will suffice the rest of the day. When the load is thrown off, the consumption of fuel is reduced accordingly, but the regularity of speed is maintained. The pneumatic governor does this and no attention is required after it has been set for the required speed, at the beginning of the day's work. The speed can be changed at any time, while the engine is in motion, by turning the thumb screw, which controls the governor valve.

Guides, as in a steam engine, carry the crosshead, relieving the cylinder from the additional wear which would occur with a "trunk" piston, as the added weight of the crosshead attached to the piston head would cause as much, if not more, friction in the cylinder. The water jacket and cylinder are separate pieces, being secured with bolts in front and rear. If lime or other substances obstruct the water, the jacket can be taken off and the obstruction removed in a few minutes' time. Power and durability have been made a study in these engines, as well as regularity in speed and low fuel consumption. Electric light plants, flour mills, factories and shops requiring regular and steady power, whether the load is uniform or variable, are especially interested. The designer, Mr. C. A. Miller, began the manufacture of these engines at Urbana, O., last year. Better facilities and a larger field were offered at Springfield, and the Miller Gas Engine Co. was the result. The company is now building 10, 20, 25, 40 and 50 h. p. engines, and expects to begin at once on 75, 100, 150 and 200 h. p. engines. J. D. Hurd is president, C. A. Miller, vice president and superintendent, and E. M. Hurd, secretary and treasurer.

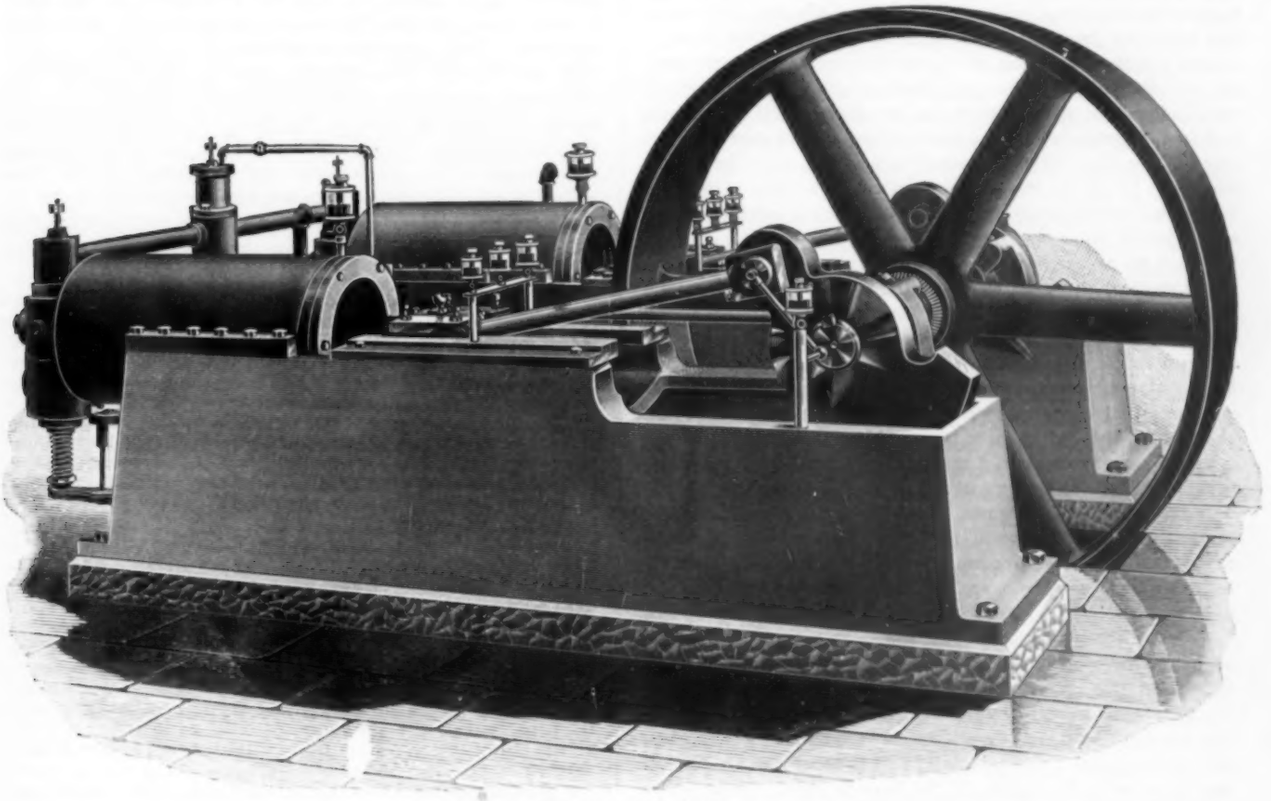
The Springfield Foundry Co., Springfield, O., gives the following statement of its experience: "We have been using

one of your 50 h. p. large double gas engines in our foundry since the middle of last April with entire satisfaction. Before purchasing an engine we investigated all the makes of such engines within our reach and decided upon yours, after being convinced that it was the best for our purpose. We believe that we are getting more than 50 h. p. For regularity of speed and economy in the use of gas, we believe that it has no equal. Last June, power for a 35-arc light dynamo was furnished by our engine to supply the light for the State convention of the Society of Christian Endeavor. This lasted four nights and the electrician in charge was perfectly satisfied with the power. The gas consumed has averaged less than 85,000 feet of natural gas per month."

The Piqua Milling Co., Piqua, O., writing under date of Jan. 16, 1896, say: "The Miller gas engine has proved very satisfactory to us. We have found it reliable and strong, and we are satisfied that it will prove durable. Its regularity of speed cannot be questioned even in a flouring mill where the best is needed. It requires no expert to run it, consequently it must be simple. As to the economy, we will give you the exact figures: In obtaining fully 65 h. p. it is consuming 550 ft. of natural gas per hour, at a 25c. per thousand rate."

Woodward & Michael, millers, of Urbana, O., write Jan. 17, as follows: "After a test of nearly a year, allow us to express the great satisfaction your gas engine has given us. Previous to this we were running our mill and elevator with a 60 h. p. engine supplied by an 85 h. p. boiler turning out 4½ to 5 bbls. of flour per hour besides running a corn roll, a feed burr and corn sheller of 2,000 bushels capacity with necessary machinery for cleaning; at a cost of $4.75 to $5 per day of 11 hours, for engineer and fuel. We are doing the same work now with your gas engine at a cost of 85c. to 90c. per day, using natural gas at 15c. per thousand cubic feet. As to the regularity of the engine compared with steam, we can notice no difference."

B. W. Maxwell's Son, Sidney, O, manufacturer of flour, says in a letter of Jan. 24, 1896: "I think the Miller engine is A No. 1 in all respects. As to power, I have a water wheel that is rated at 56 h. p., and I find that I can get at least six or eight h. p. more out of the 50 h. p. Miller double cylinder gas engine, using about 12 feet of gas a minute."



THE MILLER GAS ENGINE.

Future of Indiana's Gas Supply.

State Natural Gas Supervisor Leach, of Indiana, has finished his first annual report to State Geologist Blatchley. Concerning the present and future of the Indiana gas territory, Prof. Leach says:

"We have reached that period in the Indiana gas field when econonomic measures are of more interest than modes of origin. Instead of spending time and means to make a more elaborate display of the gas to show its abundance, we are now engaged in the invention of devices toward economy in its use. The last year has witnessed much anxiety as to the future supply and the future schedule of rates. Prices have been advanced in several cities. The Indiana gas territory originally comprised an area of 2,000 square miles. Owing to the encroachment of salt water the gas producing territory is becoming less. The original rock pressure was 325 pounds to the square inch. The rock pressure is now but 230 pounds, a decrease of 95 pounds. There is little doubt that the pressure will decrease more rapidly in the future than in the past.

"While the amount wasted is growing less, the amount consumed is greater. The means of conveying and distributing the gas are better than last year, and the companies should give better service than last winter—not that the gas is more abundant, but that the distributing facilities are better.

"The question of adopting the 'meter system' is receiving much attention. From the standpoint of economy and the longevity of the gas supply the meter system is the proper method of selling gas. The supply of gas has been equal to the demand since its discovery in 1886, filling every requirement. How long it will continue to honor the enormous drafts made upon it no one can tell definitely. It is certain that we have entered upon a period of decline, and that the supply will finally become exhausted. This evidence comes from measurements in the field, and not from theory alone. The situation is, however, not without its encouraging features. After nine years of development in the Indiana field there yet remain many thousand acres of fertile territory untouched by the drill, except an occasional well to test the productiveness of the field, to hold the leases, or to supply the farmers with fuel. A large part of this territory is owned by pipe line companies, who are holding it in reserve for future use. The developing of oil in the gas territory is injurious to gas interests. The gas wells, now registering an average pressure of 230 pounds, will continue to flow until drowned out by salt water."

ON the 18th the Ohio Falls Iron Works, of New Albany, Ind., filed a mortgage for $60,500. Immediately after the company asked for a receiver and N. T. DePauw was appointed with power to operate the plant.

SEMET-SOLVAY RETORT COKE OVENS, WITH RECOVERY OF BY-PRODUCTS.

BY R. M. ATWATER, SYRACUSE, N. Y.

The primary products of bituminous coal are coke, fuel gas, tar and ammonia; the secondary products are illuminating gas, pitch, benzole, toluol, xylol, phenol, naphthalene, anthracene, creosote and pyridine. By the present practice ,coke alone is obtained from this long list of valuable products. By means of retort ovens, all of the others, which are of far greater value, are available for the development of American industry and the use of the people of our country. Two general types of retort ovens are prominently before the public: those with vertical flues and those with horizontal flues. Vertical flue ovens are either without regeneration, as in the Coppee type, or with regeneration, as in the Otto-Hoffmann ovens. Horizontal flue ovens are either with thick walls of brick, as in the Carve type, or with thin walls of tile, as in the Semet-Solvay oven. These four classes of ovens represent to-day the development of the retort oven.

Comparing these ovens with each other, it may be fairly claimed that the system with horizontal flues is better than with vertical. The operation in the coke oven does not require the high heat of the regenerative furnace, but rather the moderate heat of direct firing. This is easily demonstrated by the operation of the beehive oven. Retort ovens are not over six feet in height. With vertical flues the heat of distillation must do its work in the short space of six feet, and in a direction where the natural flow of the gases is most rapid. The effect of this method of firing is that the higher heats will be at the top of the vertical flues, where they are baffled and turned away from the oven, but the heat of distillation should more properly be adjusted so that the greatest heat will be at the base of the retort oven. With horizontal flues, making three turns along the sides of the oven and a fourth underneath the sole of the oven, the gases pass through a circuit of 120 feet, and the opportunity of imparting heat to the interior of the furnace is easier, more economical, and better adapted to the work required. The greatest heat is easily regulated at the lower part of the oven, and the available heat of the fuel is more thoroughly exhausted.

By the same reasoning, it may easily be seen that recuperation is better than regeneration, for the moderate heat required in the coke ovens. At high temperatures, firebrick become good conductors of heat, and the heat may be transmitted through these thin walls with but little loss. When it is considered that the so-called regeneration of heat is not regeneration, bnt depends upon the heat absorbed by the firebrick checker-work, and given out again during the periods of reversal of the regenerator valves, it is not difficult to see that the two processes are identical in principle. To regenerate, however, involves duplications of the flues and checker-work, and the complicated reversing machinery, while the recuperation is much simpler and cheaper Therefore, we may agree with Mr. Darby, of the Brymbo Steel Works, when he says that after large experience with regenerative furnaces, he has no hesitation in saying that "if it is possible to do without them, an enormous amount of trouble and expense will be saved.

As to the question between horizontal flues with thick brick walls, or thin tile walls, it may be said that the thick flues require from 36 to 48 hours to do the work that the thin flues do in 18 to 24 hours, and that, even then, the resulting coke is softer. Mr. Darby states that the loss from the addition of one-half inch to the thickness of the flue wall is 30% of the heat. The use of tile 24 inches long makes fewer joints, and, consequently less danger of leakage, than where the flues are constructed of firebrick.

Considering the advantage of the retort oven over the beehive, it may be said that the first effort to use retort ovens was not to get the by-products, but to coke coals that would either not coke at all, or would only make inferior coke in beehive ovens. As the continent of Europe is now practically made over to the retort oven, it may be claimed as demonstrated that the retort oven is better than the beehive.

Retort Ovens in the United States.

The grafting of the retort oven upon the American coking industry has had its infantile vicissitudes. All of the early efforts were abortive, or still-born, or lived only to demonstrate their inability to cope with the rigor of the American climate. Their little lights went out, and left only a cairn of broken shards to tell their history. The Solvay Process Company built in 1892 a block of 12 Semet-Solvay coke ovens, and has run them without stopping ever since, and has now doubled the number, and is erecting plants in Dunbar and Sharon, Pa., and Detroit. As this company uses the coke for burning limestone at Syracuse, its practice is not conclusive for blast furnace use. But during this period, the company has made tests on a great variety of coking coals. These tests have demonstrated that the Connellsville and Pocahontas cokes from the Semet-Solvay ovens were equal in the blast furnace to the cokes from the beehive ovens. Both of the parties for whose benefit these tests were made on a large scale have decided to erect retort coke ovens. In every case, the coke has proved equal to, if not better than, the same coke from beehive ovens. In several cases, coals that cannot be successfully coked in beehive ovens have produced a marketable coke in the Semet-Solvay oven.

The most important test was made in the interest of the Johnson Co., of Lorain, O., and was conducted by the well-known expert, Mr. John Fulton, of Johnstown, as their representative. I will extract from his recently published work on coke several items covering the essential points in this test. The Semet-Solvay coke from Connellsville coal was to be compared on a working scale in the blast furnace, with the best coke in the world. The conditions of the test were severe for retort ovens. The ovens were not accustomed to the Connellsville coal, and the furnace was not accustomed to the retort coke, but was perfectly familiar with the beehive Connellsville coke. It will be granted that the odds were against the retort oven:

"To make the tests on a fairly comprehensive plan, 2,058 $\frac{1300}{2000}$ tons of Connellsville coal was shipped from the valley mines of the H. C. Frick Co. to Syracuse, for the initial coking test in the small experimental plant of 12 Semet-Solvay ovens at this place. These coking tests, as well as the subsequent blast furnace ones, were made with great care, as the importance of such determinations evidently demanded. It was the first time in the industrial records that beehive and retort oven coke, from Connellsville coal, were compared, as to economy in cost of coking, and relative value in blast furnace work, on fairly equated conditions.

"The coking in these ovens was conducted mainly to determine the minimum time required with maximum heat to produce good blast furnace coke. The tests covered the several times for coking, from 18 to 26 hours. It appeared that with well sustained oven heat, good blast furnace coke could be made in 20 hours. This was the standard minimum time used in producing the coke for furnace test. Some coke was made by continuing it in oven 26 hours. This produced a bright hard coke, evidently equal in hardness of body to the beehive coke of 72 hours. From subsequent experience in the furnace test, it is quite probable that 23 to 24 hours would secure a firmer coke, that would bear faster furnace driving.

"It will be noted that the Connellsville coke, used at the Buffalo furnace during this test, was from the Adelaide works of the H. C. Frick Coke Co. The coal used in making coke in the Semet-Solvay ovens at Syracuse, N. Y., was shipped from the Valley mines of the H. C. Frick Co. The physical determinations of the Adelaide coke exhibit a most excellent structure, equalling the standard coke of this region. The analysis shows its superior chemical purity, excelling in this respect the standard coke.

'The physical tests of the Semet-Solvay coke exhibit the increase in density in the retort coke, as compared with the beehive. These are typical examples, and indicate in a clear and definite manner the condition of coke made in these two principal types of coke ovens. The increase in cell space will be noticed in the Solvay coke, from the walls of the coking chamber to the middle of the ovens.

"The coke used at the Buffalo furnace was supplied by the H. C. Frick Coke Co. It was especially noticed as the very best quality of furnace coke; evidently it had been carefully selected, as no "black ends" were visible in the supply examined. It was, therefore, quite manifest that the best Connellsville beehive coke would be used in the comparative test with the Semet-Solvay coke. Further, it will be noted that the beehive coke was made from much cleaner coal than that from which the Solvay was made."

The five days' run with the beehive coke left the blast furnace cool and in bad condition. During the run of retort coke, the condition of the furnace steadily improved, and at the close, the furnace was working well.

*From a paper read before the meeting of the Ohio Institute of Mining Engineers, Columbus, O., Jan. 22, 1896.

"*Record of condition of furnace during tests of Connellsville beehive coke:*

"1st day, Furnace working irregularly.
"2nd " Furnace working irregularly.
"3d " Improved working.
"4th " Becoming more regular.
"5th " Furnace cool.

"*Condition of furnace during tests of Connellsville Semet-Solvay retort coke:*

"6th day, Slipping, not down to regular work.
"7th " Two slips to-day, cooling furnace.
"8th " Furnace gaining heat.
"9th " Improved working.
"10th " Working steadily."

Perhaps the most important result of this test was in the demonstration of Sir Lowthian Bell's error, in condemning all retort oven coke, because of its greater absorption of carbonic acid in the upper region of the furnace. No greater obstacle has hindered the adoption of the retort oven in America. Mr. Fulton's statement is as follows:

"The tables show that there was little waste from soft coke, as the relations of the two gases $CO : CO_2$, were found to be as 1 : 2.47 in the beehive coke, and as 1 : 2.27 in the Semet-Solvay product. Sir I. Lowthian Bell found the relations of these gases in a large test of Durham beehive coke as 1 : 2 28, and in Simond Carve's retort coke, as 1 : 3.32. The analysis of the gases at top of furnace show that there is no loss in the Solvay coke from dissolution in its passage down the furnace from carbon dioxide, but, on the other hand, it resists this gas with more firmness than the Adelaide coke."

Stating the final results of the test, Mr. Fulton says:

"The following condensed statement will show the stock used and pig iron produced from beehive and Semet-Solvay cokes, during these tests:

	Beehive Coke Test.	Semet-Solvay Coke Test.
Iron ore used	4,260,080 lbs.	4,711,190 lbs.
Limestone used	729,400 "	870,700 "
Coke used	2,403,060 "	2,775,613 "
Pig metal made	1,122 tons.	1,205 tons (2,300 lbs.)
Coke per pound of iron	.956 lbs.	1.028 lbs.

"Equating the conditions of these cokes, and eliminating excess of moisture, the coke per pound of iron will be for beehive .938 lb. and for the Semet-Solvay .972 lb. When the further fact is taken into consideration, that the Semet Solvay coke contained an average of 10.17% of ash, while the beehive had only 9 62% of this impurity, the quantity of each kind of coke to smelt one ton of foundry metal is substantially equal, and the amount of coal used in Semet-Solvay coke is proportionately reduced. Introducing the factor of relative proportions of coke made from a pound of coal in these two types of ovens, the comparison becomes as follows:

	Beehive.	Semet-Solvay.
Coal per pound of iron	1.421	1 389

"The different grades of foundry metal made during the five days' test of each kind of coke is as follows:

	No. 1.	No. 2.	No. 2 plain.	No. 3.	Ragged.	Total.
Beehive	20	357	480	237	28	1122 tons.
Solvay	73	487	461	156	28	1205 "

"It will be noted that the Solvay coke's products in pig iron Nos. 1 and 2 give 560 tons, and the beehive 377 tons. The lower products of Solvay coke in No. 2 plain, No. 3, and Ragged, give 645 tons, against 745 from the beehive coke. The difference, therefore, in the heats afforded in the metal made by beehive and Solvay coke is fairly in favor of the latter. The Semet-Solvay coke oven has been designed under correct principles, as regards wearing properties and output. Its most distinguishing property is in its rapid work in coking, which is 30% shorter in time than its chief competitors."

Retort Ovens in the Central West.

The condition of the iron industry in Ohio seems particularly favorable to the retort ovens. Furnaces located on the lake shore have a manifest advantage in lower freights than the inland furnaces, while furnaces near the coke fields have an advantage on coke, but furnaces located between the mines and the deep sea must take up every available improvement that will offset these disadvantages. When their safety is still further threatened by an attempt to monopolize the only available coke supply, it becomes necessary to fight for your hearthstones. The rational and logical solution of this difficulty is the retort coke oven. As a weapon of defense, I offer you this oven, in the confident belief that it will render coal fields ten times as large as the Connellsville field available for good blast furnace coke, and, in addition to this desirable condition, will afford a handsome profit on the by-products, now entirely wasted.

Considering, first, the advantages of the retort over the beehive coke, we may enumerate them as follows:

1. The yield of coke will be increased by converting a portion of the hydro-carbons into coke. The Syracuse record, with Morris Run coal, with 20% volatie, is 83% of good coke, against 60% obtained in the beehive oven. From Pocahontas coal, with 18% volatile, 85% of good coke was obtained, against 62% in the beehive oven, and from Connellsville coal, with 32% volatile, 72% to 75% of good coke, against 64% to 66% in the beehive ovens. No such gain is possible with internally fired ovens of the beehive type. *Note.*—Many of the current reports of the yield of coke from coal are misleading, because the unit for coal is the long ton, or even the mine ton, still further increased by the custom of giving full measures at the mines, while the unit for the coke is the short ton on the scales.

The yield of coke from the retort oven is also increased by more rapid coking, and, consequently, larger output. The output of a beehive oven is stated as from 400 to 600 tons per year. The average of the 12 Semet-Solvay ovens at Syracuse for the year 1895 was 1,543 tons per oven. The coking of the coal by the narrow oven with thin flue walls varies from 18 to 24 hours, according to the volatile in the coal. I have no hesitation in saying that 2,000 tons of blast furnace coke can be produced in one oven in one year, from Pocahontas coal.

2. The form of the coke is better for blast furnace use, as one dimension is constant. A pile of Semet-Solvay coke has much the appearance of a pile of Belgian paving blocks. This constant dimension corresponds with half of the width of the oven. It is caused by the natural flow of the gases in escaping, and making a natural cleavage through the middle of the coke. The flow of these gases in the beehive oven is vertical, but in the retort oven, is first horizontal, until they reach this middle line of cleavage, and then vertical to the outlet of the oven.

3. The density and hardness of the retort coke is greater than the beehive coke. When the coke begins to fuse and swell in the retort oven it is compressed against the narrow walls. This increased hardness is likely to bring the coals of the Pittsburg district, outside of the Connellsville district, into profit, as they seem to lack only this element of hardness to make them equal with Connellsville coal for coke.

4. Retort ovens can be placed at the blast furnace, instead of at the mines, with gain both in economy and efficiency. The rate of freight on coal is about 60 per cent of the rate on coke, representing their approximate relative values under beehive practice, but with the increased yield in the retort oven, from 75 per cent to 85 per cent of coke, it is manifest that there is direct economy in freights by bringing the coal to the blast furnace and coking it there.

By locating the ovens at the blast furnace, the use of coking coals from different localities is made possible, and the mixing of different coking coals for special purposes.

5. By locating the ovens where the coke is used, the grade of coke produced is easily controlled. The quality of the coal used and the time of coking may be varied to suit changing conditions. In this manner, blast furnace, foundry, or domestic coke may be turned out of the same oven at will.

6. With the greater yield of coke, and the equal value, ton for ton, with the beehive coke in the blast furnace, the proportion of sulphur and phosphorus added to the iron through the coke is decreased in proportion to the greater yield of coke. The ash in this coke will also be less, in proportion to the same increased yield, since all the impurities start from the coal.

By-Products from Retort Coke.

We will now consider the somewhat unknown field of the by-products.

TAR.

The product of tar in the retort oven varies with different coals, generally increasing with the volatile, and running usually between 40 and 100 lbs. per ton of coal.

1. This tar has a fuel value equivalent to about $5.00 per ton, or from 10 to 20 cents per ton of coal.

2. This tar is also largely used by the roofing and paving companies. For these purposes, it has a market value of about $8 00 per ton.

3. In Europe, a simple distillation of the crude tar is made into light oil, which is sold to the makers of aniline colors, and pitch which is sold to the paving contractors.

4. From the tar and gas together may be distilled benzol, which, as an enricher of illuminating gas, is considered better and cheaper in Europe than naphtha. In this country, owing

to the lack of an assured sufficient supply, benzol has not come into use. The large amounts capable of being obtained from retort coke ovens might make this practicable, and so establish a new industry.

5. Coke oven tar is the only material yet discovered for the economical making of fuel briquettes. No field of American enterprise has stimulated more earnest efforts than the utilization of anthracite culm, now accumulating at the mines in enormous quantities. In this connection, I recall the names of Mr. Loiseau, who exhibited at the Philadelphia Exposition of 1876, his eggettes of compressed culm; also the plan of the late Col. Price, of Scranton, to generate gas to be piped through the manufacturing regions of the east from the same source.

None of these efforts have succeeded, yet in Europe, these fuel briquettes, as they are called, in the form of a brick with rounded ends, are a standard, economical and favorite fuel, and the industry of making them has assumed large proportions. The reason for this is that the enormous production of tar at the coke ovens in Europe has made a practical binding material for this waste fuel. I think we may reasonably expect, that with the development of the retort coke oven, this great question will be settled for America as it has been for Europe.

AMMONIA.

The only source for ammonia in America heretofore has been the illuminating gas plants, but, through the development of electricity and water gas, the supply of ammonia from coal gas has been nearly stationary, while on the other hand, the uses for ammonia have largely increased. It is now an essential material in refrigerating plants, in electro-plating in the charging of batteries, in many large chemical works, and in smokeless powder. In the form of household ammonia, it has won its entrance into the grocery trade, and enormous quantities are now sold throughout the country as a domestic detergent; but the largest use is in the manufacture of fertilizers, as a substitute for nitrate of soda, imported from the Pacific Coast. The importation for the last fiscal year was over 100,000 tons of Chilian nitrate, most of which is absorbed by the fertilizer trade. At a price approaching $50 per ton, sulphate of ammonia is cheaper than nitrate of soda. It may therefore be fairly claimed that a profitable market for all the ammonia that can be produced in this country will be maintained at a price not far from $50 per ton, and as the cost of making this ammonia from the retort coke oven liquors is from $20 to $30 per ton, and the yield of ammonia is from 12 to 24 lbs. of sulphate per ton of coal consumed, it becomes a source of assured profit to the retort coke oven. It is not necessary that the ammonia from the coke oven gases shall be converted into sulphate. It is practicable to make other salts, but the market price is usually rated on the basis of sulphate.

GAS.

After coking the coal, the remaining gas is available for use or sale. It takes about 12 parts of volatile to do the coking, so in estimating the amount of gas available for other purposes, we deduct this amount and determine the amount of gas. This gas may be considered, as first, fuel gas, for manufacturing purposes; second, illuminating gas. For both these purposes, it is in constant use at Syracuse, where the works are lighted by the coke oven gas. Third, domestic fuel gas, replacing natural gas.

The quality of this gas makes it the best substitute for natural gas yet found. Reckoning the heat basis of natural gas as 100, illuminating gas is 75, coke oven gas 70, producer gas 17. It will therefore be seen that coke oven gas is more than four times as rich in heat power as producer gas. While it is not equal in heat power to natural gas, yet on account of its lighter specific gravity, the same pipes will deliver equal amounts in heat of either natural gas or coke oven gas, so that locations which are piped for natural gas can be supplied with fuel of equal effectiveness from the coke ovens.

In general it may be said, that a retort coke oven plant is simply an illuminating gas plant on a large scale.

MOND PRODUCER.

Returning again to the use of producer gas in the flues of the retort coke oven, we must consider that ordinary producer gas would be likely to cause trouble from soot and tar accumulating in the flues and interfering with the regular work of the ovens. In this connection, Mr. Ludwig Mond, of Northwich, England, has patented a new gas producer, which by a scientific method of regulating the combustion and pre-heating the incoming air and vapor, allows the recovery of from 90 to 100 lbs. of sulphate of ammonia, from every ton of bituminous slack consumed. All of the gas produced by this destructive distillation in the producer, about 150,000 cubic feet per ton of coal, is washed and the tar and ammonia recovered. It is then in good condition to use in the flues of the coke ovens.

The Solvay Process Co., by practical experiment, have satisfied themselves that this is a practical method of running coke ovens, and are now erecting a plant of eight Mond producers at Syracuse, which will gasify 175 tons of coal per day, replacing the coal in their steam plant, and the rich coke oven gas in their retort ovens.

GAS ENGINE.

The claim is made for the lately developed gas engine that it will produce power at ¾ lb. of coal per H. P. hour. At 24 hours for 365 days, this will amount to 3¼ tons of coal per H. P. per year. Comparing this with the lowest rate ever attained by the steam engine, or by water power, as offered at Niagara, it is evident that no power yet developed can equal it by 100 per cent. Therefore, the elimination of the steam boiler, and the substitution of the gas engine for the steam engine seems to be the outcome of this newly developed gas engine, which will convert coal directly into power.

The development of the gas engine has heretofore been hindered, first, by its small capacity, rarely exceeding 100 h. p., and second, by its inability to use ordinary producer gas on account of the tar and soot. The first of these difficulties is claimed to be solved by engineers in Europe, who are already using 500 H. P. gas engines, and by our own American chief engineer, Mr. George Westinghouse, Jr. The second difficulty is entirely overcome by either coke oven gas or Mond producer-gas. As the net cost of producing these two kinds of gas, owing to their treatment for the recovery of the tar and ammonia, is reduced to less than their equivalent value in coal, it would seem that the time is ripe for pushing these radical improvements to their full development.

INDUSTRIAL SUMMARY.

New Buyers in the Market, and Some of Their Wants :—

[If you are in need of machinery of any description, please notify *The Iron Trade Review* and we will put you in communication with our advertisers at once.]

A company has been formed at Charleston, W. Va , to erect a foundry and machine shop. Walter Cherry will be superintendent.

The Anniston Iron & Steel Co., Anniston, Ala., is in the market for a rail-shearing machine with engine a tachment, new or second-hand.

The East Moline Tool Co., East Moline, Ill., has been incorporated with a capital stock of $75,000, by Adolph W. Shirring, Charles H. Pope and Edward B. Kreis.

The Lincoln Bicycle Co. has been incorporated at Chicago, with a capital stock of $10,000, to manufacture bicycles, by Frank W. Swett, John Gately and Arthur E. Swett.

The Gilbert Iron & Steel Mfg. Co has been incorporated at Harrisburg, Pa., with a capital stock of $35.000, by L. D. Gilbert, W. U. Hercher, Chas. Beaver, and Frederick Long.

The Alconia Tin & Terne Plate Co., of Irondale, O., has been incorporated with $10,000 capital, by W. S. Collier, D. Morris, W. T. Lewis, John E. Thomas and J. H. Jeremiah.

The Frank C. Reick Supply Co. has been incorporated at Chicago, with a capital stock of $5,000, to manufacture emery wheels, etc., by Frank C. Reick, M. A. Bartleson and C. A. Armstrong.

At the office of the Supervising Architect, Washington, D. C., sealed proposals will be received until 2 P. M. Feb. 15, 1896, for all the labor and materials for furnishing and erecting complete a hydraulic passenger elevator, including pumps, tanks, piping, car, etc., for the U. S. Post Office, Custom House, etc., building at Jacksonville, Fla.

The Standard Malleable Iron Co. has been incorporated at Muskegon, Mich. Geo. H. Kingsley is president; Eugene L. Howe, vice president and general manager; Patrick J. Martin, treasurer; Martin O. Senseny, secretary, and J. Preston Rice, general sales agent. The company will use a well equipped

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plant which has been idle for some time, and will have it running by March 1.

The Corus Fence & Foundry Co., of Dayton, O., has been incorporated at Richmond, Ind. with a capital stock of $50,000. The directors named are: Charles F. Corus, Charles M. Corus, Moses Wiswonger, Charles E. Wiswonger, Samuel Boyer, Chris. W. Uthbrok and Charles H. Faust.

New Construction:—

The Ohio River Railroad Co. is building at Parkersburg, W. Va., a shop 180x80 ft. for the repair and manufacturer of passenger cars.

The New York Central & Hudson River road will build a new roundhouse at Niagara Falls, N. Y. It will have stalls for 24 locomotives and will be built of brick and iron.

The Anderson, (Ind.) Foundry & Machine Co. is operating its new machine shop, 50x100 feet, of brick and equipped with improved machinery. A new 72-inch boring mill will soon be put in operation.

The power house for the Brunswick Traction Co., at Milltown, N. J., will be furnished by the Berlin Iron Bridge Co., of East Berlin, Conn. The engine room will be 64 ft. long and 85 ft. wide, and the boiler room 45 ft. wide and 48 ft. long. The side walls are of brick and the roof trusses of iron.

T. C. Thompson & Co. have the contract for building the car wheel plant of N. S. Bouton, of Chicago, at Birmingham, Ala., for $12,000. Pits and foundations will cost about $8,000 more. The buildings are to be completed by May 1, and the plant is to be running at that time 60 tons of iron a day, employing 60 men.

Additions, Enlargements, Removals, Etc.:—

The additions now being made to the plant of the Brown Hoisting & Conveying Machine Co., Cleveland, will permit of a considerable enlargement of the output. Contracts for six coal-handling plants are now on hand. The company is also busy in its crane department.

At the American Steel Casting Co.'s Alliance, O., plant, a large addition, to cost $100,000, is being built. Two electric traveling cranes are to be furnished by the Morgan Engineering Co.

Fires and Accidents:—

The wheel foundry of the Michigan Peninsular Car Works, at Detroit, burned on Jan. 17. Loss about $35,000. The building was 240x400 ft., and contained 1,500 car wheels.

General Industrial Notes:—

The Collins Furnace, at Bellefonte, Pa., is about to go into blast.

The Pittsburg Forge & Iron Co. started 10 puddling furnaces last week.

The East End and Lebanon Rolling Mills, of Lebanon, Pa., have started up again after being idle for some time.

There is no foundation for the report that the Buffalo Furnace Co. is contemplating the erection of another furnace.

The Braddock, Pa., plant of the Consolidated Steel & Wire Works Co. resumed this week after a month's shut-down.

The Georgetown Nail Mills, of Georgetown, Pa., have been started up for the first time. They were built two years ago.

The Poultney Foundry & Engineering Works, of Youngstown, O., has been incorporated with a capital stock of $50,000.

The Westinghouse Electric & Mfg. Co.'s plant at Pittsburg, has resumed in full, after a period of operation with partial force.

The name of the Mackellar Foundry Facing & Supply Co., of Quincy, Ill., has been changed to the Quincy Foundry & Facing Co.

The reorganization of the Racine Iron Co., Racine, Wis., has been affected. John Armstrong, late superintendent and general manager of the Hurlburt Mfg. Co., becomes treasurer, and W. P. Brown, late president and superintendent of the

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1—38″x14′ New Haven Engine Lathe.
1—Bement Car Axle Lathe.
1—24x24x7 ft. New Haven Planer.
1—30x30x8 ft. Harrington Planer.
1—36x36x18 ft. Sellers Planer.
1—36x36x20 ft. N. Y. Steam Engine Co. Planer.
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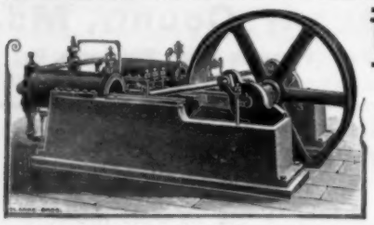

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We are now prepared to place licenses for the use of the WALRAND LEGENISEL process, and to undertake the design and construction of plants with supervision of preliminary operation. The process can be seen in operation at the works of POTTER & HOLLIS FOUNDRY CO., at E. Chicago, Ind. This process is unequaled for the manufacture of solid and flawless steel castings or for any purpose requiring sound masses of steel.

OFFICE, 525 ROOKERY, CHICAGO.

Racine Malleable & Wrought Iron Co., becomes president, each having acquired a large interest.

The plant of the Altoona Foundry & Machine Co., Altoona, Pa., has been closed down and the property is to be put upon the market.

The A. Boyce Bunker Hill Foundry & Machine Co., Bunker Hill, Ill., has changed its name to the Bunker Hill Foundry & Machine Co.

The building has been completed for the new rod mill of the Illinois Steel Co., at Joliet, and the machinery is now being installed.

Zug & Co. Pittsburg, had to close down their puddling mill owing to a break in the water main. The sheet mill has been closed since Dec. 20.

The Ætna-Standard Iron & Steel Co, Bridgeport, O., has an order for 3,000 boxes of tin plate for Eastern shipment and another order for 1,200 tons of light steel sheets.

No. 1 Furnace of the Dunbar Furnace Co, Dunbar, Pa., closed down two or three days recently for repairs. No. 2 furnace of this concern is idle, undergoing extensive repairs.

The East Moline Engine & Tool Co., East Moline, Ill., expects to have its factory completed in March, ready to turn out gasoline engines, edged tools, automatic bicycle pumps, etc.

Last week was one of the dullest with Youngstown mills, in months. Considerably increased forces are at work this week, however. The Ohio Steel Co.'s works have been steadily occupied of late.

One of the improvements added to the Edgar Thomson Steel Works, at Braddock, during the recent suspension is a new finishing mill, containing a full set of hot beds and straightening presses.

The National Foundry & Pipe Works, at Scottdale, Pa., has resumed after a shut down of several weeks. A new building was erected for the pipe testing machines, coating tanks, etc., and the machinery generally overhauled.

The Wellston Furnace Co.'s stack at Wellston, Jackson Co., O., producing American-Scotch iron, made an output of 17,500 tons in 310 days in 1895. Of this amount, 95 per cent was No. 1 and No. 2 foundry iron. The present output is 80 tons a day.

Thomas Carlin's Sons, Allegheny, Pa., have bought from the Southern Iron & Steel Co. the entire plant of the Roane Iron Co., at Chattanooga, Tenn. The purchasers prefer to

sell the plant as a whole, and failing to do that will wreck it and sell it in parts.

The recent large order for projectiles received by the Sterling Steel Co. from the Government has necessitated extensive additions to its plant at McKeesport, Pa. Among the improvements are two annealing furnaces, a gas producer, and a powerful dynamo.

The contracts for the power plant to be installed by Messrs. Griffiths & Scott for their new tin plate plant to be erected at Washington, Pa., have been awarded. They include 32x60 Corliss engine, one 500 h. p. feed-water heater, 500 h. p. boilers and two throttling engines of 40 h. p. capacity.

Car building: At the Michigan, Pennsylvania Car Co.'s plant, Detroit, 500 cars are under way for the Duluth, South Shore & Atlantic; at Madison Car Co.'s works, Madison, Ill.; 100 refrigerator cars for the Overland Fruit Dispatch. The Bay Terminal road at Toledo, O., has doubled its capital stock for new rolling stock. The Quebec Central has ordered 100 box cars. The Cincinnati, Jackson & Mackinaw will buy five freight engines.

The Crescent Sheet & Tin Plate Co. at its annual meeting in Cleveland last week, decided to begin at once the operation of its tinning department. Heretofore it has confined itself to black plates. The following directors were elected: H. P. McIntosh, Arthur B. Foster, Francis Widlar, N. C. Brewer, R. H. Boggis, W. J. Morgan, E. W. Moore, James Paton and J. A. Mathews. The officers for the ensuing year are: H. P. McIntosh, president; Arthur B. Foster, vice president; J. A. Mathews, secretary, and treasurer, and James Paton, superintendent.

The Miller Gas Engine Co., of Springfield, O., is now located in the south wing of the East Street shops built by Wm. Whiteley, the mower and reaper manufacturer. The company has put in a large amount of new machinery consisting of lathes, planers, shapers, milling machines, drill presses, the equipment being furnished by the Pratt & Whitney Co. and the Davis & Egan Machine Tool Co. The Miller Gas Engine Co. is now building a full line of double and single cylinder gas engines, which are becoming well known throughout the country for their distinctive features. They are supplied with the company's patent pneumatic governor. This is a new departure, calculated to give the gas engine a firmer hold on public favor, as it makes this class of power less complicated, more reliable and much more economical in the consumption of fuel.

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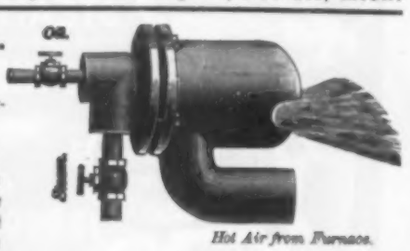

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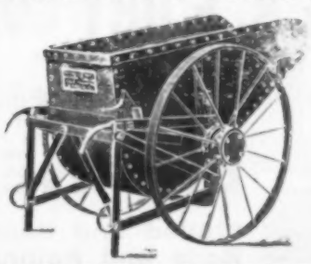

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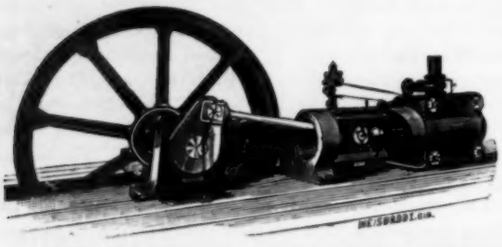

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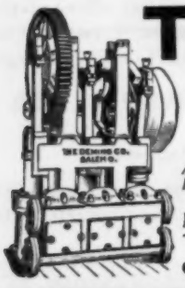

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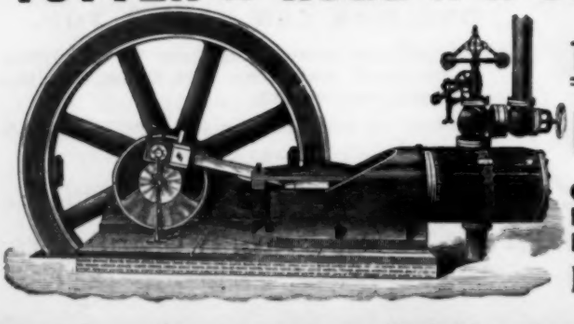

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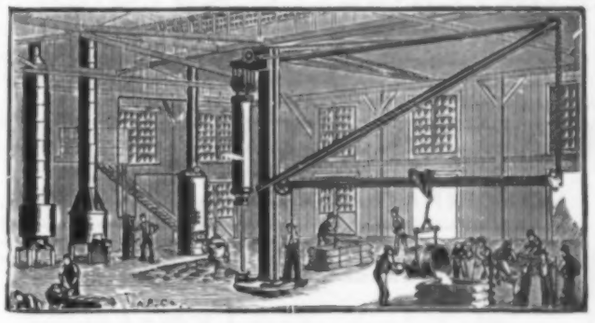

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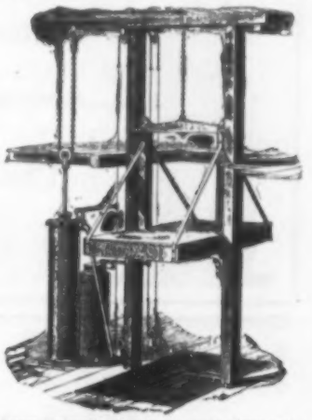

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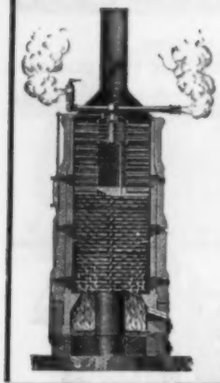

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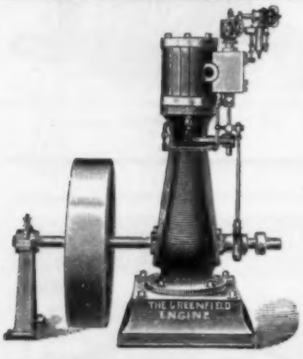

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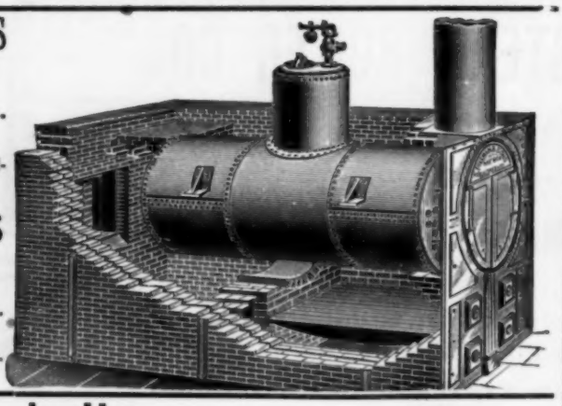

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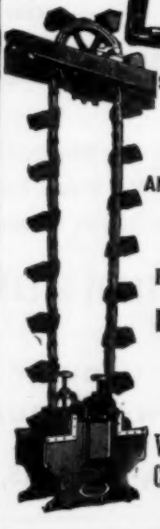

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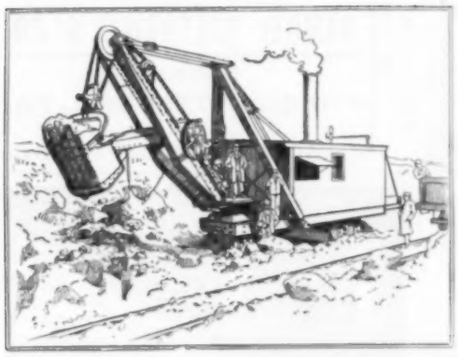

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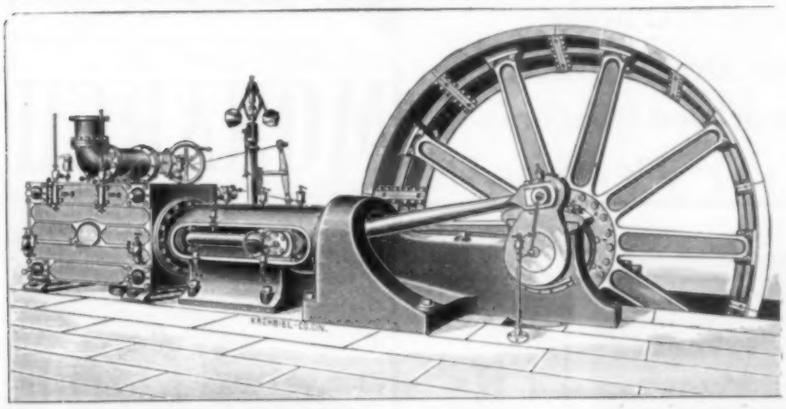

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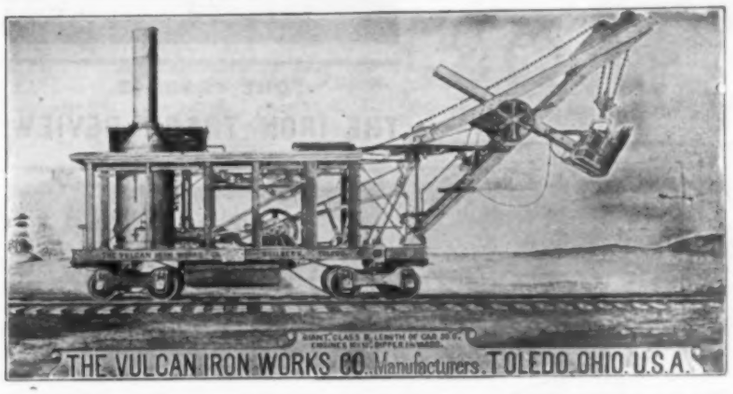

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Sample piece of FLUE taken from Locomotive No. 725 running for 7 months on Western Division of N.Y.C.&H.R.R.R. showing amount of SCALE adhering in that time.

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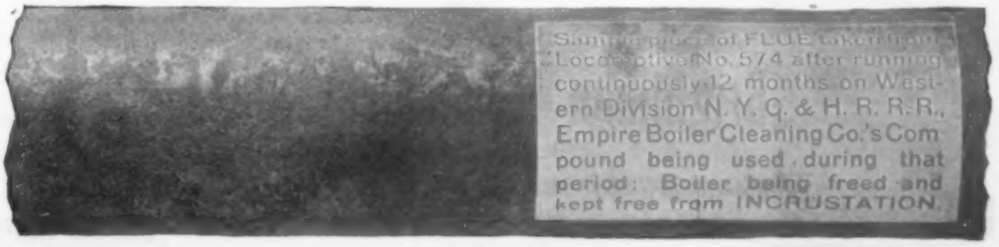
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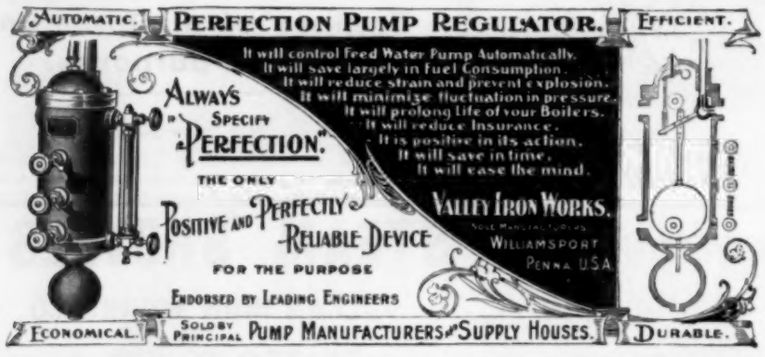
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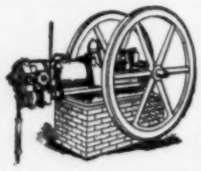

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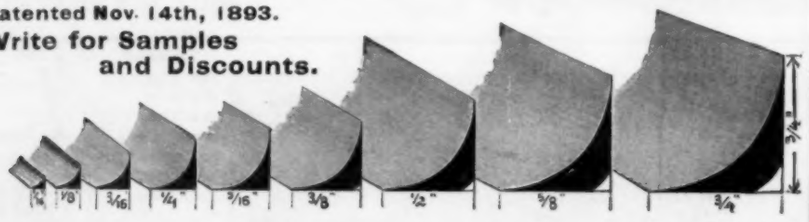

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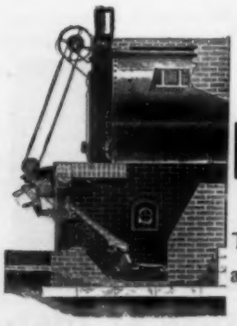

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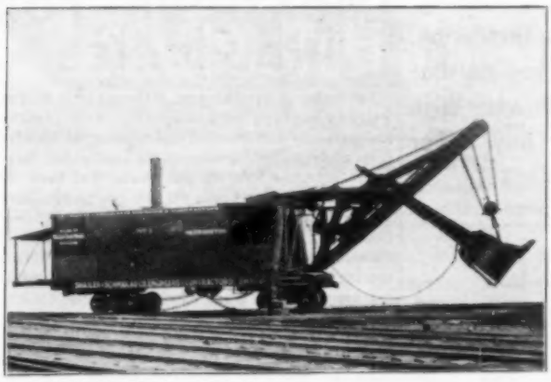

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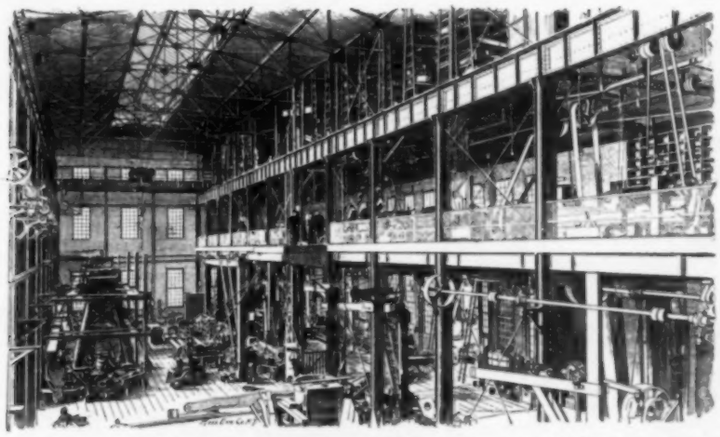

The above illustration is taken direct from a photograph, and shows the interior of a Machine Shop designed and built by us for The Dry Dock Engine Co., at Detroit, Mich. The central portion or Erecting Room is 40 ft. wide with a gallery three stories high on one side, this gallery being 27 ft. in width. The upper floor of the gallery is used for storing patterns while the second floor is used for light machine work—this lower floor being controlled by jib cranes, which also swing out into the central portion, thus delivering material from the wing by means of the jib cranes and the travelling crane to any portion of the Erecting Room. The whole frame work of the building is of iron, with brick filling for the side walls.

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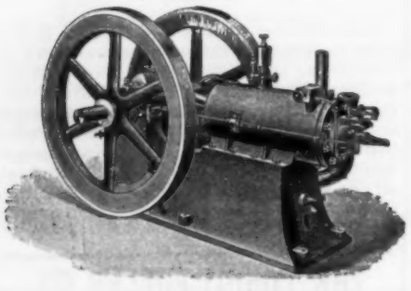

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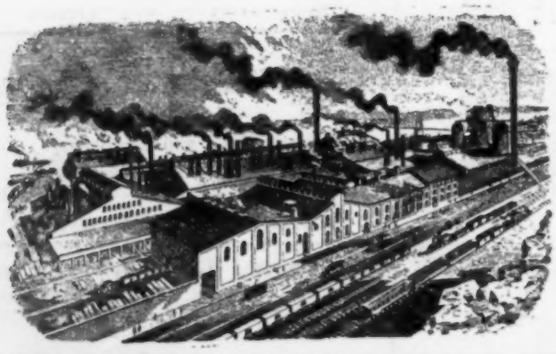

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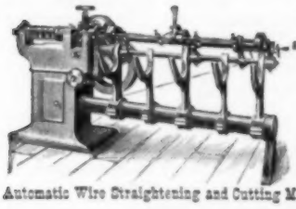

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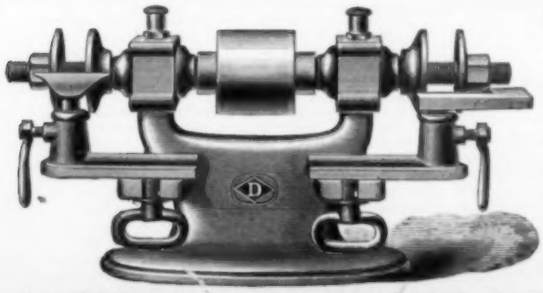

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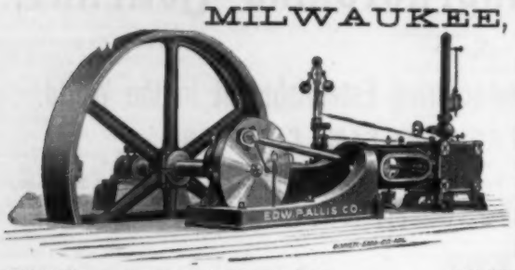

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Wright Co	27
Young, J. D	19

SUBSCRIBE FOR

The Iron Trade Review.

$3.00 Per Year.

IRON AND STEEL MARKETS.

IRON ORE.

[On Lake Erie docks.]

No. 1 Specular, Bessemer	$4.75@ 5.25
No. 1 Bessemer hematite	4.25@ 4.50
Hematites No. 1 non-Bessemer	2.50@ 3.00
No 1. Specular, non-Bessemer	3.00@ 3.50

PIG IRON.

CLEVELAND (f. o. b. cars):	
Bessemer	$13 25
No. 1 Strong Foundry	13 75@ 14 00
No. 2 Strong Foundry	13 00@ 13 25
No. 1 Gray Forge, red short	11 50@ 11 75
No. 2 Gray Forge, neutral	11 00
No. 1 American Scotch	14 00
No. 2 American Scotch	13 50@ 13 75
Lake Superior Charcoal	14 25@ 15 25
PITTSBURG:	
No. 1 Foundry	$13 50@ 13 75
No. 2 Foundry	13 00@ 13 25
Gray Forge	11 25@ 11 50
White and Mottled	11 00@ 11 25
Warm Blast Charcoal	16 00@ 17 00
Cold Blast Charcoal	22 00@ 26 00
Bessemer	13 00@ 13 25
CHICAGO (reported by our representative:)	
Lake Superior Charcoal	$14 50@$15 50
Local Coke Foundry No. 1	13 50@ 14 00
Local Coke Foundry No. 2	13 00@ 13 50
Local Coke Foundry No. 3	12 50@ 13 00
Local Scotch Foundry No. 1	13 50@ 14 00
Local Scotch Foundry No. 2	13 00@ 13 50
Local Scotch Foundry No. 3	12 50@ 13 00
Southern Coke No. 1	12 35@ 12 85
Southern Coke No. 2	12 10@ 12 35
Southern Coke No. 3	11 85@ 12 10
Southern No. 1 Soft	12 35@ 12 85
Southern No. 2 Soft	11 85@ 12 35
Southern Silveries No. 1	13 35
Southern Silveries No. 2	12 85
Jackson Co. Silveries	14 50@ 16 00
Ohio Silveries No. 1	15 00@ 15 50
Ohio Silveries No. 2	14 50@ 15 00
Ohio Strong Softeners	15 00@ 15 50
Alabama Car Wheel	17 50@ 18 00
Malleable Bessemer	
Coke Bessemer	
CINCINNATI (reported by Rogers, Brown & Co.)	
Southern Coke No. 1, Foundry	$11 75
Southern Coke No. 2 and No. 1 Soft	$11 50@ 11 75
Hanging Rock Coke, No 1	12 50@ 13 50
Hanging Rock Charcoal No. 1, Fdy	16 00@ 17 00
Tennessee Charcoal No 1	13 50@ 14 00
Jackson County Silvery No 1	14 00@ 15 00
Southern Coke, Gray Forge	10 75
" " Mottled	10 50
Standard Alabama Car Wheel	15 75@ 16 25
Tennessee " "	14 50@ 15 00
Lake Superior " "	15 75@ 16 25
BUFFALO (reported by Rogers, Brown & Co.)	
No. 1 Foundry Strong Coke Iron Lake Superior Ore	$13 50
No. 2 Foundry Strong Coke Iron Lake Superior Ore	13 00
Ohio Strong Softener No. 1	15 50
Jackson Co. Silvery No. 1	15 25@ 16 00
Lake Superior Charcoal	14 75@ 15 25
Southern Soft No. 1	13 50
Hanging Rock Charcoal	18 50
ST. LOUIS (reported by Rogers, Brown & Meacham):	
Southern Coke No 1	$12 25
Southern Coke No. 2	12 00
Southern Coke No. 3	11 75
Southern Gray Forge	11 25
Southern Charcoal No. 1	14 50@ 15 00
Missouri Charcoal No. 1	14 00@ 15 00
Ohio Softeners	16 00@ 17 00
Lake Superior Car Wheel	17 00@ 17 50
Southern Car Wheel	16 50@ 17 00

OLD RAILS AND SCRAP METAL.

	Gross Tons
Old iron rails	$17 00
Old steel rails	12 50
Old car wheels	13 00
	Net Tons
No. 1 R. R. wrought scrap	$12 00
Mill scrap	9 50
No. 1 Machine cast scrap	10 00
Iron axles	16 00
Axle turnings	9 00
Wrought turnings (free from cast)	8 50
Cast borings	7 50
Uncut wrought iron boilers	5 00
Steel boiler plates	10 00
Grate bars	6 50
Pipes and flues (clean)	8 50
Tank iron	9 00
Hoop and band iron	7 00
Sheet iron	6 50
Wrought drillings	7 50
Malleable iron	9 00

STRUCTURAL MATERIAL.

Beams and Channels (Cleveland mill)	1.49c@1.54c
Angles	1.34c@1.39c
Tees	1.49c
Universal Plates	1.45c
Sheared Plates	1.55c

MERCHANT IRON AND STEEL.

[List prices out of store.]

Flat Bar.

1½ to 4 by ⅜ to 1 inch	1 60
4½ to 6 by ⅜ to 1 inch	1 65
1½ to 6 by 1⅛ to 2 inch	1 85
1½ & 1¾ by ⅜ to ¾ inch	1 60
1 & 1¼ by ⅜ to ¾ inch	1 70
⅛, ¾, ⅞, by ¾ to 1½ inch	1 80

Frank P. Cady, Pres. and Supt.
Geo. H. Bowler, Sec'y and Treas.

THE CADY MFG. CO.

18, 20 and 22 Johnson St., CLEVELAND, O.

SEND FOR OUR NEW CATALOGUE OF Power Presses, Drop Hammers, Punches and Shears, Wire Working and Special Machinery.

PERFORATED METALS

OF ALL KINDS FOR

MILLING MINING AND AGRICULTURAL MACHINERY,

PERFORATED IRON, STEEL, COPPER, BRASS, TIN, ZINC, LEAD, ETC., TO ORDER.

LARGE AND VARIED ASSORTMENT OF SIZES. CORRESPONDENCE SOLICITED.

THE ROBERT AITCHISON. PERFORATED METAL CO.,

OFFICE, ROOM 510 265 TO 269 DEARBORN STREET, CHICAGO, ILL. WORKS SOUTH CHICAGO.

Splice Bar Punch. (2)

—THE—

Long & Allstatter Co.

HAMILTON, O., U. S. A.

Manufacturers of Belt, Steam and Electrically driven

POWER PUNCHES and SHEARS,

for all kinds of Boiler, Tank and Structural Iron Work, Rolling Mills, Locomotive Shops, Car and Wagon Shops, Plow Shops, etc. Send for Catalogue.

A. H. LEITCH, PREST. JOHN C. LEITCH, SEC. AND TREAS

WESTMORELAND FIRE BRICK CO. MANUFACTURERS OF HIGH GRADE FIRE BRICKS.

PITTSBURG, PA.

Works and Mines, Westmoreland, Pa.

PL DIXON'S PERFECT LUBRICATING GRAPHITE.

The most Marvelous Lubricant Known.
Used Dry, or Mixed with Water, Oil or Grease

NOT AFFECTED BY HEAT, COLD, STEAM OR ACIDS.

An Interesting and Instructive Pamphlet will be sent Free of Charge.

JOS. DIXON CRUCIBLE CO. Jersey City, N. J.

IRON CLAD PAINT CO.

Factory, 75 & 77 Central Way. Sec. & Treas., No. 3 Case Build'g.

CLEVELAND, OHIO.

Trade Mark Patented.

ORDER DIRECT FROM THE

Iron Clad Paint Co.

And get the genuine article, and save liability of suit for using an article made in violation of the patents issued to Wm. Green, and now owned by this Company.

IRON CLAD PAINT is the most durable, most fire-proof and Cheapest Paint made.

FURNISHED both Dry and Ground in Oil

USED BY NEARLY ALL THE RAILROADS.

Round and Square.

1 to 1⅜ inch	1 60
2 to 2¾ inch	1 80
2¾ to 3¼ inch	1 75
3¾ to 4 inch	2 10
4¼ to 4½ inch	2 70
4¾ to 5 inch	2 90

Oval.

⅜ to 1¼ inch	1 80
⅝ to ¾ inch	1 80
½	2 00
⅝	2 20

Half Oval and Half Round.

1⅛ to 3 inch	2 15
⅞ to 1⅛ inch	1 95
⅝ to ¾ inch	2 20
½	2 35
⅜	3 45

Heavy Band.

1¾ to 6 by ¼ and 5-16 inch	1 70
1 to 1⅜ by ¼ and 5-16 inch	1 75
⅝ to ⅞ by ¼ and 5-16 inch	1 85
⅛ to ⅝ by ¼ and 5-16 inch	2 10

Hoop Iron.

1 7-16 to 4, No. 13, 14, 15 and 16	2 15
1 7-16 to 2, No. 17, 18 and 19	2 20
1 7-16 to 2, No. 20	2 30
1 7-16 to 2, No. 21	2 40
1 7-16 to 2, No. 22	2 50
1⅛ to 1⅜, No. 13, 14 and 15	2 20
1⅛ to 1⅜, No. 16, 17 and 18	2 25
1⅛ to 1⅜, No 19 and 20	2 30
1⅛ to 1⅜, No. 21	2 40
1⅛ to 1⅜, No. 22	2 50
15-16 and 1 inch, No. 13, 14 and 15	2 15
15-16 and 1 inch, No. 16, 17 and 18	2 30
15-16 and 1 inch, No. 19 and 20	2 40
15-16 and 1 inch, No. 21	2 [illegible]
15-16 and 1 inch, No. 22	2 6[illegible]
⅞, No. 13, 14 and 15	2 40
⅞, No. 16, 17 and 18	2 [illegible]
⅞, No. 19 and 20	2 60
⅞, No. 21	2 70
⅞, No. 22	2 80
13-16, No. 13, 14 and 15	2 50
13-16, No. 16, 17 and 18	2 60
13-16, No. 19 and 20	2 70
13-16, No. 21	2 80
13-16, No. 22	2 90
¾, No. 13, 14 and 15	2 60
¾, No. 16, 17 and 18	2 75
¾, No. 19 and 20	2 85
¾, No. 21	2 95
¾, No. 22	3 05
11-16, No. 13, 14 and 15	2 85
11-16, No. 16, 17 and 18	2 95
11-16, No. 19 and 20	3 05
11-16, No. 21	3 10
11-16, No. 22	3 20
11-16, No. 23	3 30
⅝, No. 13, and 15	2 90
⅝, No. 16, 17 and 18	3 00
⅝, No. 19 and 20	3 10
⅝, No. 21	3 20
⅝, No. 22	3 30
⅝, No. 23	3 40
9-16, No. 13, 14 and 15	3 10
9-16, No. 16, 17 and 18	3 20
9-16, No. and 20	3 30
9-16, No. 21	3 40
9-16, No. 22	3 50
9-16, No. 23	3 60
7-16 and ⅝ inch, No. 13, 14 and 15	3 30
7-16 and ⅝ inch, No. 16, 17 and 18	3 40
7-16 and ⅝ inch, No. 19 and 20	3 50
7-16 and ⅝ inch, No. 21	3 60
7-16 and ⅝ inch, No. 22	3 70
7-16 and ½ inch, No. 23	3 80
⅜, No. 13, 14 and 15	3 80
⅜, No. 16, 17 and 18	3 90
⅜, No. 19 and 20	4 00
⅜, No. 21	5 31
⅜, No. 22	4 40
⅜, No. 23	4 55

Light Band.

1½ to 6 by ⅛ to 3-16 inch	1 90
1⅛ to 6 by Nos. 11 and 12	1 95
1 to 1⅜ by ⅛ to 3-16 inch	1 95
1 to 1⅜ by Nos. 11 and 12	2 00
⅞ and 13-16 by ⅛ to 3-16 inch	2 10
⅞ and 13-16 by Nos. 11 and 12	2 15
¾ and 11-16 by ⅛ to 3-16 inch	2 20
¾ and 11-16 by Nos. 11 and 12	2 25
⅝ and 9-16 by ⅛ to 3-16 inch	2 35
⅝ and 9-16 by Nos. 11 and 12	2 40
½ by ⅛ to 3-16 inch	2 50
½ by Nos. 11 and 12	2 55

Wagon Box Iron.

⅜ inch, beveled edge, by Nos. 11 and 12	2 10
⅜ inch, " " " " 13 and 14	2 20
½ inch, " " " " 11 and 12	2 25
½ inch, " " " " 13 and 14	1 55

Sheet Iron.

No. 10	2 10
No. 12	2 20
No. 14	2 25
No. 15-17	2 35
No. 18	2 50
No. 20	2 65
No. 22-24	2 75
No. 25 26	2 85
No 27	2 95

Steel Boiler Plates—1-4 in. and Heavier.

Tank	2 00
Shell	2 15
Flange	2 25
Marine Flange	2 60
Fire Box	3 70

Above includes plates 90 inches wide

90 to 96 in. wide	⅛c. ₰ extra
96 to 100 in. wide	¼c. "
100 to 104 in. wide	⅓c. "
104 to 106 in. wide	special

American Cast Tool Steel.

ROUND, SQUARE AND OCTAGON.	cts ₰s
1 to 2 in. inclusive	08
9-16 to ⅞ in. "	08

ÆTNA-STANDARD IRON AND STEEL COMPANY,

BRIDGEPORT, OHIO,

MANUFACTURERS OF

TIN AND TERNE PLATE, Iron and Steel Plates and Sheets, Plain Black, Painted, Corrugated and other forms of ROOFING, SIDING and CEILING. Patent Leveled Galvanized Sheets, BARS, Light Section Rails, ANGLES, Tees, Channels, and other Miscellaneous Bars and SHAPES.

WITH SUCH DIVERSITY OF PRODUCT,

SPECIAL ADVANTAGES are offered buyers of mixed lots, effecting saving in freight charges and by reason of our LARGE STOCKS, securing **PROMPT SHIPMENT.**

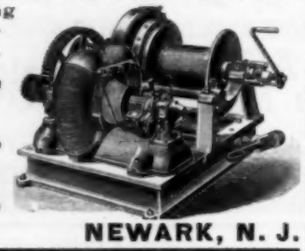
INQUIRIES INVITED AND CATALOGUES MAILED ON APPLICATION.

HOISTING MACHINERY

for Mining, Quarrying, Coal Handling, Pile Driving, Bridge Building, Log Hauling, and for general Contractors' Use. Improved Electric Hoists, single and double Patent Friction Drum, compound, geared with brakes and reversible for general Hoisting, Mining Purposes and Suspension Cable Ways.

Send for illustrated Catalogue giving full description, etc.

CORRESPONDENCE SOLICITED



W. A. CROOK & BROS' CO.

Salesrooms 143 Liberty st., N. Y. 117-123 POINIER ST. NEWARK, N. J.

W. H. COFFMAN COKE CO.

BLUEFIELD, W. VA.

GENERAL FACTORS AND SHIPPERS OF

POCAHONTAS FLAT-TOP COKE.

So low in ash that it requires no fluxing for foundry purposes. Our foundry and furnace coke was awarded the first premium at the World's Fair in 1893.

AVERAGE ANALYSIS OF COKE.

Moisture	00.196	Sulphur	00.677
Fixed Carbon	93.625	Ash	05 004
Volatile Matter	00.494		

Foundry, Furnace and all sizes of crushed coke. Guaranteed lower in Sulphur than any other commercial coke

STEEL CASTINGS

FROM 10 LBS. UPWARD.

Made from Best Open-Hearth Steel.

SEND FOR ESTIMATES.

THE JOHNSON COMPANY, Johnstown, Pa.

The Iron Trade Review

Pays special attention to iron ore, blast furnace, rolling mill, foundry and machine shop interests. Per year **$3.00.**

GARDEN CITY FOUNDRY CO.

INCORPORATED.

Successors to TURNER, DICKINSON & CO.

Armitage and Central Avenues, Station G, Chicago, Ill.

FRICTION CLUTCHES, HANGERS, PILLOW BLOCKS & PULLEYS.

Large Stocks on Hand. Shipments Promptly Made.

7-16 to ⅜ and 2⅜ to 3 in.	.09
3⅛ to 4 in.	.09½
⅞ to 11-16 and 4⅛	.10
⅛ to 6 in.	.10¼
½ to 9-32 and 6⅛ to 7 in.	.11
7 in	.13

Flats.

	cts. lbs
¼ to 9-16 in. wide by 2 to ⅝ thick	.8

Bessemer and O. H. Steel.

Bessemer Machinery	base price,	1 50
Open-hearth Tire	"	1 80
Open-hearth Spring	"	2 20
Sleigh Shoe	"	1 90
Toe Calk	"	2 10
Cutter Shoes, tapered and bent	"	2 20

English Tool Steel.

Jessop's	15½c
Hobson's "Best"	15½c
" "Choice"	35c

Burden Boiler Rivets.

½, ⅝, 11-16 and ¾ inches diameter	3 30
Bridge ½, ⅝, 11-16 and ¾ inch diam.	3 00

Wrought Pipe and Boiler Tubes.

Lap weld black, base	dis. 65
Butt " " "	dis. [illegible]
Lap " galv. "	dis. 5 ½
Butt " " "	dis. 50
Boiler tubes 2¼" and smaller	dis 6 ½
Boiler tubes 2½" and larger	dis. 65
Casing screw and socket joint	dis. 52½
Casing inserted joint	dis. 4 ½

MACHINERY SUPPLY MARKET.

Anvils.

American	₩ lb 9@10
Wright's	₩ lb 12

Bellows.

Blacksmiths'	Hill's dis 40
	Bullock's dis 50&10
Moulders'	dis 40@40&10
Hand	dis 40&10@50

Belting.

Boston Belting Co.'s standard	dis 70
" " " extra	dis 60&5
" " " best	dis 55
Cleveland Rubber Co. extra standard	dis 60&10
Hoyt's Short Lap	dis 45
Shultz Raw Hide Leather Belting, single	dis 40
Munson's Short Lap Single Leather	dis 50
Munson's Short Lap Double and Light Double Leather	dis 50&10
Shultz Raw Hide Leather Belting, Double and Light Double	dis 40
Standard, oak tanned	dis 50&10
Alexander Brothers' pure oak tanned	dis

Blowers and Exhausters.

B. F. Sturtevant's	dis 20
Boston Blower Co.,	dis 35
Buffalo	dis 40

Chucks.

Cushman's 4 Jaw Independent	dis 45
" Combination	dis 40
" Geared Scroll	dis 30
" 2 Jaw Brass Workers	dis 30
" Drill	dis 35
Wescott's Scroll Combination	dis 33⅓
" Independent	dis 40
" Little Giant Drill	dis
Horton's Universal	dis
" Independent	dis 45
Whiton's Independent	dis 45
National Combination	dis 40
Sweetland "	dis 40
Almond Drill	dis 20
Morse "	dis 15
Skinner's Combination Lathe	dis 40&10
" Independent Lathe	dis 40&10
" Universal Lathe	dis 40&10
" Drill	dis 20

Cutters and Reamers.

Cleveland	dis 10@15
Pratt & Whitney	dis 10@15
Standard	dis 10@15
Morse	dis 15
Brown & Sharpe, Milling Cutters	dis
" " Gear Cutters	dis

Crowbars.

Cast Steel	₩ lb 3½
Iron, steel points	₩ lb 3

Drill and Drill Sockets.

Twist Drills	dis 50&10
Morse Taper and Straight Shank to 1½"	dis 50&10
Morse Taper and Straight Shank Larger than 1½"	dis 25
Drill Sockets	dis 25
Standard Twist Drills	dis 55@55&5
Cleveland " "	dis 55@55&5

SHIFFLER BRIDGE COMPANY,

BUILDING DEPARTMENT.

SPECIALTIES: STEEL AND IRON BUILDINGS FOR ROLLING-MILLS TIN PLATE PLANTS, STEEL WORKS, FOUNDRIES, FACTORIES, ROOF TRUSSES, GIRDERS, COLUMNS, BEAMS, CORRUGATED IRON, ETC.

Main Office and Works:
48th Street and A. V. Ry.
PITTSBURG, PA.

Branch Offices:
1123 Betz Building, Philadelphia, Pa.
65 Dexter Building, Chicago, Ill.
228 Lumber Exchange, Minneapolis, Minn.

WORLD'S FAIR AWARD.

We are the only Steel Roofing Co. awarded Medal and Diploma for **PATENT CAP ROOFING** at World's Columbian Exposition. We are also large manufacturers of all styles of METAL ROOFING, SIDING, CEILING, ETC. Send for Catalogue and Price List. Mention this paper.

SYKES IRON & STEEL ROOFING CO., - Chicago and Niles, O.

Lansing Hand-Made Pig Iron Barrow.

Made for carrying pig iron castings, etc. Sizes of bottom 3 ft. long by 2 ft. wide, 8½ in high in front, bottom 1¼ in thick. We iron the bottom of this barrow with strips of ¼-in. iron, which we bolt to the bottom and handles. All irons are bolted and nothing but first-class timber used in these wheelbarrows. Handles made of 2x3 in. white oak or hickory. Wheel very heavy, diameter 19 in., tread 1¾ in., tire ¼ in. thick. Iron bands on ends of legs. This is a wheelbarrow that will stand work. Weight of barrow, 90 lbs. Telegraph name, Seaboard. Write for prices of steel barrows, trucks, etc., to (4)

Lansing Wheelbarrow Co., Lansing, Mich.

W. J. McKINNIE, Pres. W. A. MADISON, Sec'y and Treas.

THE PLAYFORD STOKER

A perfect smoke preventing furnace; perfect combustion, minimum of expense, simple in construction and economical.

A test of three tubular boilers of Cleveland Water Works, made Oct. 4th, 1895, by a waterworks engineer, shows an evaporation of over ten pounds of water to one pound of nut coal, and during the test the stack was entirely free from smoke.

The PLAYFORD STOKER CO., 919 SOCIETY FOR SAVINGS CLEVELAND, O.

H. CHANNON COMPANY,

DEALERS IN

Wire Rope, Manila ope, Packings, Tackle Blocks and Chain Hoists, Cotton Waste.

24-26 Market St., CHICAGO.

Cleveland Union Station.

Pennsylvania Lines.

Foot of Bank Street.

TICKET OFFICES at Station, Euclid Av., Woodland Av., and Weddell House corner.

THROUGH TRAINS RUN AS FOLLOWS BY CENTRAL TIME
* Daily. † Daily, except Sunday.

FROM CLEVELAND TO	LEAVE	ARRIVE
Pittsburgh and Bellaire	† 7:00 am	†12:10 pm
Salem and Pittsburg	* 8:00 am	* 8:30 pm
Pittsburgh, Bellaire and East	†12:45 pm	† 6:25 pm
Philadelphia and New York	* 1:40 pm	*11:25 am
Baltimore and Washington	* 1:40 pm	*11:25 am
Alliance and Pittsburgh	* 1:40 pm	*11:25 am
Ravenna and Alliance	* 5:00 pm	* 8:30 am
Philadelphia and New York	*11:10 pm	* 5:25 am
Baltimore and Washington	*11:10 pm	* 5:25 am
Alliance and Pittsburgh	*11:10 pm	* 5:25 am

Mt. Vernon and Pan-Handle Route

FROM CLEVELAND TO	LEAVE	ARRIVE
Xenia and Cincinnati	* 8:10 am	* 5:45 pm
Akron and Columbus	* 8:10 am	*5:45 pm
Akron, Columbus & Zanesville	†2:45 pm	†12:10 pm
Columbus and Cincinnati	* 8:00 pm	* 7:30 am

The Cleveland Terminal & Valley R. R. Co.

Depot foot of So. Water St.
City Office 137 Superior St.

	Arrive.	Depart.
Valley Jctn. & Way Stations	*6:30 P M	*7:10 A M
Akron, Canton & Valley	*10:10 A M	*3:15 P M
Akron, Canton & Chicago	*8:10 A M	*6:30 P M
Akron, Canton & Worcester, Defiance, Garrett, Marietta, Wheeling, Washington, D. C., and Baltimore	†2:55 P M	†11:00 A M

†Daily except Sunday. *Daily. Pullman's Palace Vestibule sleeping cars between Cleveland and Chicago.

A growing circulation among machine shop and foundry firms, has THE IRON TRADE REVIEW.

Emery.

	No. 4 to No. 46 gr.	54 to Flour, 150 gr.	C. F. F. FF.
Kegs, ℔	4½c	5 c	2½c
½ kegs ℔	4¾c	5½c	2¾c
¼ kegs ℔	5 c	5½c	3 c
10 ℔ cans, 10 in case	6 c	6½c	5 c
10 ℔ cans less than 10	10 c	10 c	7½c

Emery Cloth and Paper.

Barder, Adamson & Co. ..... dis 50@50&5
H. H. Barton ..... dis 50@50&5

Emery Wheels.

Detroit ..... dis 60@70
Norton's ..... dis 60@70
Grant ..... dis 60@70
Sterling ..... dis 60@70
Celluloid ..... dis 10&33⅓
Northampton ..... dis 55
Crystal ..... dis 65@70
Vitrified ..... dis 60@70
Vulcanite ..... dis 60&10
Hamden ..... dis 60&10@70
Cyclone ..... dis 60@60&10

Files.

Arcade ..... dis 60&10@60&10&10
Nicholson ..... dis 60&10@60&10&10
" X. F. ..... dis 25
Kearney & Foot ..... dis 60&10@60&10&10
Black Diamond ..... dis 60&10@60&10&10
McClellan ..... dis 60&10@60&10&10
Disston's ..... dis 65@70
Western ..... dis 70
Stub's ..... dis 25
Grobet's ..... dis 30
Reynolds Bros.' Hand Cut ..... dis 50
Industry File Works Hand Cut ..... dis 50

Hammers.

P. S. W ..... dis 40
Atha new list, Jan. 15, 1887 ..... dis 50
Heavy hammers and sledges under 5 lbs. 12c
" " " over 5 lbs. 10c

Jack Screws.

Illinois Bolt Co. list ..... dis 75

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4½	4	3½	3½
Hexagon	15½	11½	8½	6	5½	5¼	
Washers	9	8	7	5	4½	4½	4½

In lots less than 100 lbs, ℔ add ½c., 1 ℔ boxes add 1c to list.

Nails (wire).

List July 14, 1887 ..... dis 85
Standard Penny Nails, ℔ keg card rate
Car lots $2.30
Less than car lots $2.50

Oilers.

Zinc and Tin ..... dis 60
Brass and Copper ..... dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ℔ doz ..... dis 10@10&10

Picks.

Railroads, 5 to 6 lbs. ..... $12 dis 60
" 6 to 7 lbs. ..... $13 dis 60

Pulleys.

Iron Pulleys, Walker List ..... dis 50
Medart Pulleys ..... dis 50
Split Wood Pulleys ..... dis 55@60

Pulley Blocks.

Moore's Anti-Friction Differential Chain Pulley Block ..... dis 20

Rivets.

Iron, Thousand, list November 1, 1894 ..... dis 60@65
Iron, Ordinary, Cooper's Block and Carriage list November 1, 1894 ..... dis 60@65
Copper ..... dis 50@50&10

Taps.

Cards, Hand and Nut to 2 in. ..... is 50
Carpenters' " " " ..... dis 50
Morse " " " ..... dis 50
Pratt & Whitney " " new list ..... dis 10
Machine Screw Taps ..... dis 55
Pipe Taps to 2½ in. ..... dis 70
Stay Bolt Taps ..... dis 25
Stove Bolt Taps ..... dis 55
Pulley Taps ..... dis 40

Vises.

Solid Box ..... dis 60
Parker's ..... dis 20@25
Prentiss ..... dis 20
Stephen's ..... dis 25@30
Barrett's ..... dis 30
Miller's Falls ..... dis 40
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Howard ..... dis 35

Wire.

New List, Apr. 9, 1894

Brass ..... dis 4c
Copper ..... dis 4c
Bright and annealed, Nos. 0@18 ..... dis 70&10&5
" " Nos. 19@26 ..... dis 75@75&5
" " Nos. 27@36 ..... dis 75&10&5
Coppered Nos. 0 to 18, market list ..... dis 70@70&5
Galvanized Nos. 0 to 18 " " ..... dis65&5
Tinned market Nos. 0 to 18 ..... dis 67½
Cast steel ..... dis 50
Tinned Broom Wire ..... dis 70&5@70&10
Annealed Fence, Nos. 8 and 9 ..... dis 75
Annealed Grape, Nos. 10 to 14 ..... dis 75
Stub's Steel Wire regular ..... 95c ℔ dis 30

Wrenches.

Coe's genuine ..... dis 50
Girard Standard ..... dis 70&10
Agricultural ..... dis 75&10
Mechanic's ..... dis 55&10&5
Bemis & Call's Combination ..... dis 35
Donohue's Engineers ..... dis 20&10
Lamson & Sessions Engineers ..... dis 60
Billings & Spencer's Drop Forged ..... dis 25
William's " " ..... dis 25
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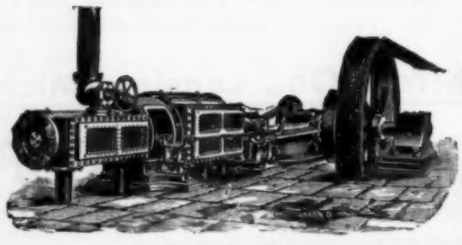

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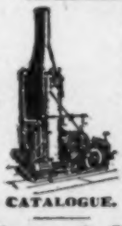

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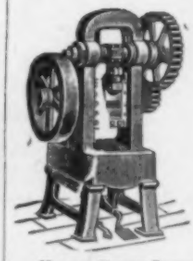

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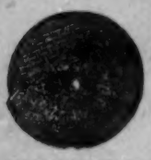

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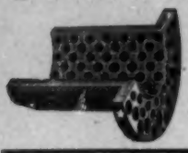

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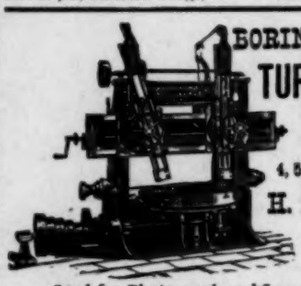

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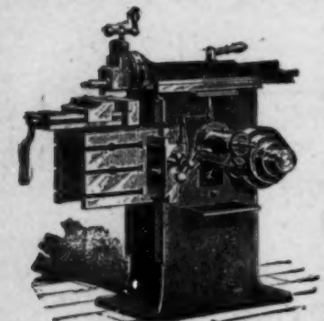

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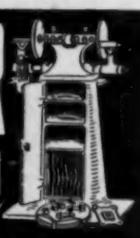

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